PEARCE-SIMPSON
DIVISION OF GLADDING CORPORATION
First in Outdoor Recreation Since 1816
P.O. BOX 800 BISCAYNE ANNEX, MIAMI, FLORIDA 33152
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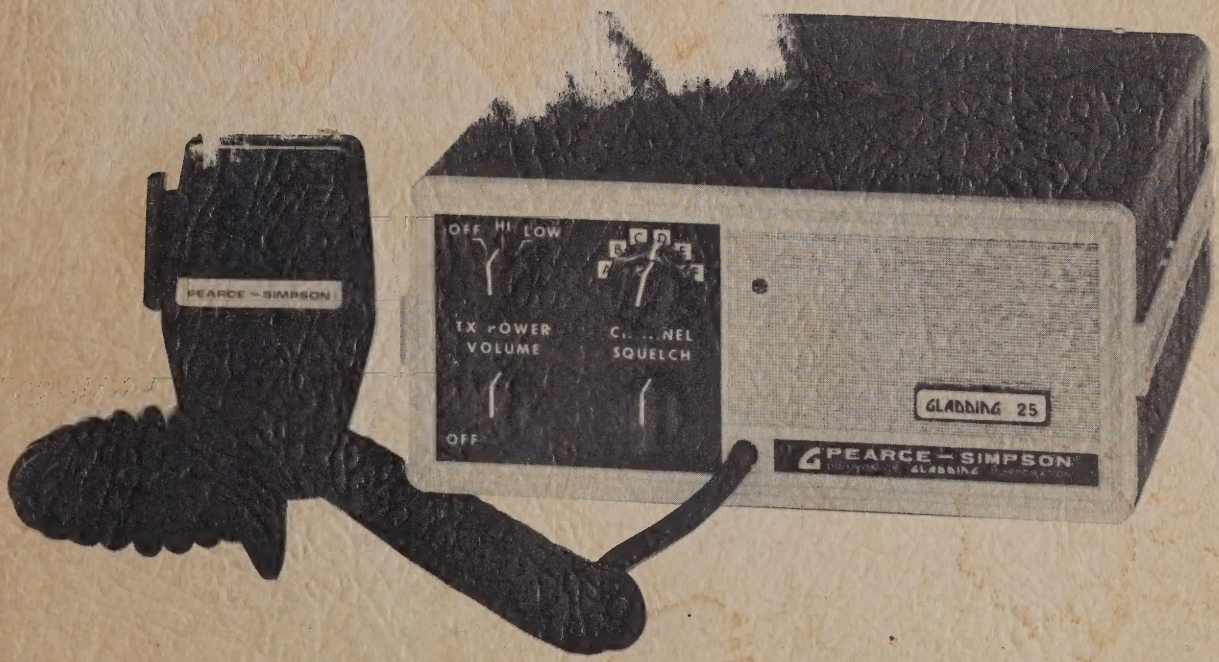


2 METER FM AMATEUR TRANSCEIVER

GLADDING 25

Manual No. 4096

GLADDING 25

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

SIZE: 8-1/2" X 3-1/2" X 10"

WEIGHT: 8-1/2 pounds

SUPPLY VOLTAGE: 13.6 Volts DC Negative Ground

CURRENT DRAIN: Receive 0.4 amp Standby 1.2 amp Transmit 10.0 amp

FREQUENCY RANGE: 144 to 148 MHZ
1 MHZ spread maximum

CHANNELS: 6 Crystal Controlled

TRANSMITTER SPECIFICATIONS

POWER OUTPUT: 25 watts on "HI" position 1 watt on "LOW" position

OUTPUT IMPEDANCE: 50 ohms unbalanced

MODULATION: ± 5 kHz Phase Modulation with automatic deviation limiting

FREQUENCY TOLERANCE: ± 0.001% over the range -30° to + 60° C

HARMONIC & SPURIOUS EMISSION: 60 DB Down or Greater

RECEIVER SPECIFICATIONS

SENSITIVITY: 0.3 uV or less for 12 DB SINAD @ 2/3 system deviation

1ST INTERMEDIATE FREQ: 10.7 mHz Employing 8 pole crystal filter

2ND INTERMEDIATE FREQ: 455 kHz

SQUELCH: Adjustable, 0.2 uV or less for 80% Rated Audio Output

FREQUENCY TOLERANCE: ± 0.001% over the range -30 to + 60 C

AUDIO POWER OUTPUT: 2.0 Watts @ 10% Distortion

SPURIOUS REJECTION: 60 DB or Greater

SELECTIVITY: ± 6.5 kHz @ 6 DB Down; ±13 kHz @ 60 DB Down

ACCESSORIES AVAILABLE

GLADDING PS AC Power Supply, Crystals

CONTROL FUNCTIONS

1. ON-OFF, VOLUME CONTROL: Applies power to receiver and adjusts desired level of sound.

2. SQUELCH CONTROL: Silences background noise in absence of a received signal when properly set.

3. TX POWER: "OFF" position disables transmitter for extended listening periods with low battery drain. "HI" position enables transmitter at 25 watt output level when push-to-talk switch is pushed. "LOW" position enables transmitter at 1 watt output level when push-to-talk switch is pushed.

4. CHANNEL: Selects desired channel.

OPERATING THE GLADDING 25

RECEIVER:

1. Rotate the VOLUME CONTROL clockwise a few degrees until the switch snaps into the "ON" position. Advance the VOLUME CONTROL to the desired audio level.

2. The SQUELCH CONTROL should initially be placed in the fully counter clockwise position. Advance the squelch control until the background noise on an unoccupied channel is reduced to full quieting. Do not advance the control beyond this point.

3. Turn the CHANNEL SELECTOR SWITCH to the desired channel.

TRANSMITTER:

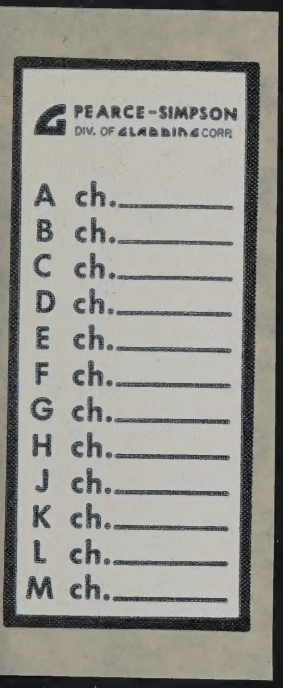
The operation of the transmitter and receiver is controlled by the "Push-to-talk" switch located on the side of the handset. When depressed, the transmitter is placed into operation and the receiver becomes inoperative. When released, the receiver is automatically restored to operation and at the same time, the transmitter becomes inoperative.

1. Place the "TX POWER" switch in either the "HI" or "LOW" position dependent on the range of desired communications.

2. Allow the transmitter tubes 30 seconds for warmup before pressing the "push-to-talk" switch. This will allow time to monitor the selected channel to be certain it is clear before starting your transmission.

3. The indicator lamp located at the top center of the GLADDING 25 will be on whenever the transmitter is activated.

4. While monitoring, the "TX POWER" switch may be placed in the "OFF" position to conserve battery power.


PEARCE-SIMPSON
DIV. OF GLADDING CORP.
A ch.
B ch.
C ch.
D ch.
E ch.
F ch.
G ch.
H ch.
J ch.
K ch.
L ch.
M ch.

THEORY OF OPERATION-RECEIVER

The GLADDING 25 receiver uses a conventional double conversion superheterodyne circuit, employing Intermediate Frequencies of 10.7 mHz and 455 kHz. Modern design philosophy is employed throughout as demonstrated by the use of field effect transistors, integrated circuits, crystal lattice filter, diode switching, and feedback stabilized amplifier stages.

Refer to the block diagram, figure 3, and the schematic diagram for the following description of circuit functions and operation.

The received signal from the antenna is passed through a P I section low pass filter (also used in the transmitter output) to a dual tuned input circuit. The signal is then amplified by Q-201 and passes through another dual tuned bandpass network to the field effect mixer stage, Q-202.

The first mixer, a field effect transistor, provides greater suppression to intermodulation and certain spurious than conventional transistors. The mixer is fed with the VHF signal and the local oscillator to provide and IF output signal of 10.7 mHz. The local oscillator uses 78 mHz crystals and provides an output frequency of twice the crystal frequency. The mixer output is passed through an 8 pole crystal lattice filter to obtain a very high degree of adjacent channel rejection. Q-301 and Q-302 serve as direct coupled 10.7 mHz IF amplifiers with a high level of DC feedback to obtain stability. Q-304, the second mixer has an output of 455 kHz which is direct coupled to Q-305. Local oscillator injection for the second mixer is obtained from the 11.155 mHz oscillator, Q-303.

CR-301 and CR-302 are amplitude limiters used to prevent overdriving succeeding stages. The output of the second mixer is passed through a 455 kHz IF transformer to the integrated circuit IF amplifier/limiter which brings the signal to a level sufficient to operate the detector and squelch circuits.

A slope detector, composed of T-401 and CR-401, is used to recover the frequency modulation. The use of a slope detector provides great ease of tuning and a degree of stability that is not obtainable with more conventional FM detectors. T-401 is detuned from 455 kHz into a linear region of the selectivity curve by adjusting for a fixed DC level at TP-401. The squelch noise detector is operated in a similar fashion except that it is tuned to 455 kHz or the peak of the reponse for optimum performance.

The output from the slope detector is amplified in a conventional manner by Q-401, Q-402, and Q-403. The output from Q-403 is transformer coupled to the push-pull audio output stages, Q-101, and Q-102.

The noise output from the squelch detector, CR-402, is amplified by Q-404 and rectified by the base-emitter junction of Q-405. Q-405 also serves as a DC amplifier to provide the squelch voltage to Q-402. Components in the squelch amplifier and rectifier circuits have been selected to provide the best possible frequency shaping for positive action with the squelch control.

THEORY OF OPERATION-TRANSMITTER

The GLADDING 25 transmitter uses a multiplication factor of 12. Fundamental crystals operating at approximately 12 mHz in a voltage and temperature stabilized circuit provide minimal frequency drifts.

The speech amplifier transistor, Q-501, amplifies the output of the carbon microphone to a level such that the symmetrical amplitude limiter formed by CR-501 and CR-502 are sufficiently driven to provide absolute peak clipping to provide modulation limiting. This level also provides a degree of speech clipping to allow more effective communications. The biasing of the amplitude limiter is adjusted by potentiometer R-507, to set the maximum system deviation. This adjustment is to be made with a 1500 Hz modulating signal at an amplitude of at least 102 mV RMS at the microphone input terminal. Pre-emphasis is provided by C-502. The output from the limiter is fed to a low pass filter composed of L-501, C-505, C-506, and C-507. This filter provides very sharp attenuation of frequencies above 2500 Hz to prevent radiation outside the permissible bandwidth.
De-emphasis is generated by the roll off network composed of R-510 and C-508.
Further attenuation of high frequencies is obtained by C-504 operating in conjunction with the output resistance of the amplitude limiter.

The output of the oscillator and the speech processing stages are combined in the phase modulator, Q-502. Output from this stage is amplified by an integrated circuit to provide a high degree of isolation and sufficient output signal to effectively drive the first multiplier transistor, Q-503.

The first multiplier transistor has an output frequency of approximately 36.5 mHz. Q-504, the second multiplier, has an output frequency of 73 mHz. Q-505 operates straight through at 73 mHz to provide sufficient drive to V-101. V-101 multiplies the signal to the output frequency and provides drive to the power amplifier stage. V-102 operates straight through at 146 mHz. The plate circuit of the power amplifier is series tuned and inductively coupled to a PI-section output tuned circuit, to obtain supression of harmonics.
In addition, a fixed PI-section low pass filter is installed in the antenna lead to enhance harmonic supression of the transmitter.
High voltage for operation of the driver and power amplifier tubes is obtained by utilizing the receiver audio output stages as a two transformer DC to DC converter. The primary of the audio driver transformer is switched by the push to talk relay so that feedback is provided to sustain oscillation, and hence generate the high voltage available on the high voltage secondary of the output transformer.

Low power operation (1 watt output) is obtained by dropping the screen voltage to the power amplifier stage. A shunt resistor to ground is switched in by S-101A to perform this function.

PROPER OPERATION OF THE GLADDING 25 CALLS FOR A RESONATE 50 OHM ANTENNA. THE INSTALLATION SHOULD BE CHECKED TO SEE THAT THE ANTENNA DOES NOT PRESENT AN APPRECIABLE STANDING WAVE RATIO. IF A HIGH STANDING RATIO EXITS, CORRECTIVE ACTION MUST BE TAKEN WITH THE ANTENNA. THE TRANSMITTER SHOULD NOT BE RETUNED IN AN ATTEMPT TO CORRECT FOR A FAULTY ANTENNA SYSTEM.

CRYSTAL INFORMATION

The crystals supplied with the Gladding 25 are precision units designed to exacting requirements. It is urged that crystals be purchased from Pearce-Simpson to obtain optimum performance from the Gladding 25.

The part numbering system employed for Gladding 25 crystals is coded to provide the operating frequency as an integral part of the part number. Transmitter crystals are prefixed by the number 0526 and receiver crystals by the number 0527. The suffix indicates the number of mHz, hundreds of kHz, and tens of kHz above 140.000 mHz to designate the operating frequency. As an example crystal part numbers for operation on 146.940 mHz are:

Transmitter	0526-694
Receiver	0527-694

Hence:

$$\begin{array}{r} 140.000\,\text{mHz} \\ +\ 6.940\,\text{mHz} \\ \hline 146.940\,\text{mHz} \end{array}$$

The crystal frequencies may be calculated by applying the following formulas:

$$\text{TX crystal frequency} = \frac{\text{TX output frequency}}{12}$$

$$\text{RX crystal frequency} = \frac{\text{RX input frequency} + 10.700\,\text{mHz}}{2}$$

Most commonly used frequencies are stocked by Pearce-Simpson. When ordering crystals, state the operating frequency, part number, and mention specifically that it is for use in the Gladding 25. Crystal are stocked in even ten kHz increments only, starting at 144.000 mHz.

ALIGNMENT PROCEDURES-GENERAL

THE GLADDING 25 HAS BEEN FACTORY ALIGNED USING TECHNIQUES AND TEST EQUIPMENT NOT NORMALLY AVAILABLE TO THE AMATEUR. IT SHOULD NOT BE NECESSARY TO PERFORM ANY ALIGNMENT ON THE UNIT AS RECEIVED FROM THE FACTORY. IN THE EVENT OF COMPONENT FAILURE, ANY REALIGNMENT WILL BE MINIMAL. IF IT APPEARS THAT ANY LARGE DEGREE OF REALIGNMENT IS REQUIRED, THROUGHLY CHECK THE REPLACEMENT COMPONENT BEFORE PROCEEDING.

ALIGNMENT PROCEDURE-RECEIVER

1. Equipment Required: Tuneable 50 ohm VHF FM signal generator with variable output attenuator.
   Audio VTVM with at least 10mv sensitivity.
   13.6 VDC Power Source with 10A capability.
   Multi-range DC VTVM.
   Frequency measuring device with .0001% accuracy.
   Non-metallic hex and flat bit alignment tools.

2. Set-up: Initial front panel controls should be set in the following manner:
   TX POWER---Off
   CHANNEL-- Mid-band crystal position
   VOLUME--Off
   SQUELCH--Fully counter-clock-wise

   Attach the power cable to the 13.6 VDC supply.
   Connect the signal generator to the antenna jack.
   Connect the Audio VTVM from the outside speaker terminal to ground.
   Connect the DC VTVM to TP-401, using plus 5 volt scale.
   Turn on the set with the switch on the volume control.

3. Procedure:
   A. Set the signal generator output level to 200,000 uV and 4 kHz deviation with 1 kHz audio, tune the generator frequency until audio output is heard from the speaker. Decrease the generator output level until the modulating frequency is marginally perceptable through the noise. Adjust T-401 such that the slug is positioned fully into the IF can. Adjust L-205, T-301, and T-302 for maximum audio output. As each tuning adjustment is made, the signal generator output level should be reduced to maintain a marginally perceptable output signal. The output signal level may consist of significant noise along with the modulation.

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   Audio VTVM with at least 10mv sensitivity.
   13.6 VDC Power Source with 10A capability.
   Multi-range DC VTVM.
   Frequency measuring device with .0001% accuracy.
   Non-metallic hex and flat bit alignment tools.

2. Set-up: Initial front panel controls should be set in the following manner:
   TX POWER---Off
   CHANNEL-- Mid-band crystal position
   VOLUME--Off
   SQUELCH--Fully counter-clock-wise

   Attach the power cable to the 13.6 VDC supply.
   Connect the signal generator to the antenna jack.
   Connect the Audio VTVM from the outside speaker terminal to ground.
   Connect the DC VTVM to TP-401, using plus 5 volt scale.
   Turn on the set with the switch on the volume control.

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GLADDING PS AC POWER SUPPLY

SPECIFICATIONS:

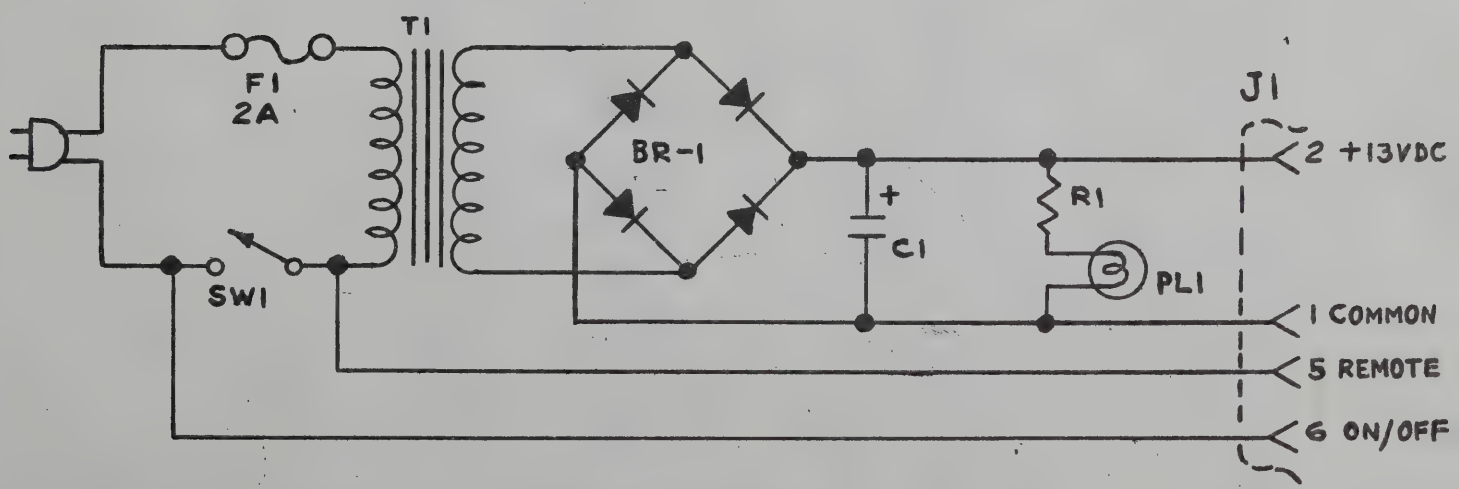
Input Voltage:	117 VAC @ 50 to 60 cycles
Output Voltage:	Nominal 12 volt DC system (10 amperes maximum)
Size:	8 1/2" wide x 3 3/4" high x 9 1/2" deep
Styling:	Compatible with Pearce-Simpson VHF FM base station transceivers

The GLADDING PS AC power supply is designed to power the Pearce-Simpson series of VHF FM transceivers in base station service. Mobile transceivers may be converted to base operation by the addition of the GLADDING PS power supply. Connections in the GLADDING PS and the base station unit are such that the power supply may be controlled by the ON-OFF switch of the transceiver. An extra set of rubber feet are provided with the GLADDING PS to be attached to the transceiver for desk placement of the unit.

The circuit of the GLADDING PS is a straight forward transformer - full wave bridge rectifier - capacity input filter system. The regulation provided by conservative design of components used in the GLADDING PS is ample for operation of the Pearce-Simpson series of transceivers.

PARTS LIST:

Symbol	Description	Part No.
C-1	18,000 mf, 25 WVDC electrolytic	0406-077
F-1	2 amp, type 3AG fuse	0801-025
----	Fuse Holder	0802-001
----	Rubber Feet	1119-003
T-1	Power Transformer	1202-173
PL-1	Pilot Lamp # 161	1801-023
R-1	27 ohm 1 watt resistor	2002-270
BR-1	Bridge Rectifier	2102-030
----	Lamp Socket	2301-051
J-1	6 Pin Female Connector	2303-050
----	Cover (Top or Bottom)	2601-129
----	Front Panel Assembly	2601-130



B. The signal generator must now be set to the center of the crystal filter passband. This may be done by tuning the generator for minimum distortion on the audio output. The signal generator level should be set such that the noise is not completely quieted.

C. Reduce the signal generator output to zero and set the volume control for a convenient level of background noise. Adjust the audio VTVM for approximate full scale deflection on an appropriate range. Increase the signal generator output level until approximately 15 db of noise quieting occurs. Further adjust L-205, T-301, & T-302 for maximum quieting. Reduce the generator output level as necessary to maintain 15 db of quieting while making the above adjustments. Increase the generator output by 20 db. Adjust T-401 for 3 volts as read on the DC VTVM attached to TP-401. This setting will only be correct for the first 3 volt reading obtained as the slug is brought from the bottom of the can.

D. Reduce the generator level until 15 db of noise quieting is again obtained. Adjust L-201, L-202, L-203, L-204, and L-206 for maximum quieting. The generator output level should be reduced to maintain 15 db of quieting during these adjustments. There is some interaction between these adjustments so they should be repeated until an absolute peak is reached.

E. Reduce the signal generator level to zero. Attach the DC VTVM to TP-402. Adjust T-402 for maximum deflection on the VTVM. Assure that the squelch control is in the full counter-clockwise position for this adjustment. After adjustment check that the background noise is fully squelched when the control is advanced.

F. This completes receiver alignment. The receiver crystal frequencies may be checked by coupling through a small capacitor (no more than 1.5pf) to the collector of the oscillator transistor, Q-203, with a counter or heterodyne frequency meter. The crystal frequency may be determined by applying the following formula:

$$F_X = \frac{\text{Channel Frequency (Hz)} + 10{,}700{,}000 \text{ (Hz)}}{2}$$

The crystal frequency is marked on the side of the crystal.

ALIGNMENT PROCEDURE-TRANSMITTER

1. Equipment Required:
   VHF wattmeter and 50 ohm dummy load.
   13.6 VDC power source with 10 A. capability.
   Multi-range DC VTVM
   Audio signal generator capable of producing 100 mv signal into 50 ohm load.
   Audio VTVM with at least 10mv sensitivity.
   Deviation Meter
   Frequency measuring device with .0001% accuracy
   Non-metallic hex and flat bit alignment tools.

2. Set-up: Initial front panel controls should be set in the following manner:
   TX POWER--Low
   CHANNEL--Mid-band crystal position
   VOLUME-Off
   SQUELCH--Any

   Attach the power cable to the 13.6 VDC supply.
   Connect the wattmeter and dummy load.
   Remove the exciter module cover and the rear cover.
   Connect the audio generator through a 100 mf (10 V Minimum) electrolytic capacitor to the audio input terminal of the exciter module (disconnect the normal input wire.)
   Connect the audio VTVM across the audio generator and set the output to zero.
   Connect the deviation meter as described in the manual for your particular instrument.
   Set the DC VTVM to read approximately 2 VDC and connect to TP-501.
   Turn on the set and allow at least 1 minute for warm-up.

3. Procedure:

   CAUTION: THE OSCILLATOR MODULE COVER AND THE POWER AMPLIFIER COVER MUST BE IN PLACE AND PROPERLY SCREWED DOWN FOR THE FOLLOWING ADJUSTMENTS.

   A. Key the transmitter and adjust C-521 for maximum deflection of the VTVM. Move the VTVM to TP-503. Key the transmitter and adjust L-502 and L-503 for maximum deflection on the VTVM. Move the VTVM to TP-504. Adjust L-504 for maximum deflection on the VTVM. Adjust the VTVM to read approximately -25 VDC. Attach the VTVM to TP-505. Key the transmitter and adjust L-505 and L-506 for maximum deflection on the VTVM. Adjust the VTVM to read approximately -50 VDC. Attach the VTVM to TP-101. Key the transmitter and adjust C-112 for maximum deflection on the VTVM. With the transmitter keyed, adjust C-115 and C-116 for maximum output as indicated on the wattmeter.

B. Place the "TX POWER" switch into the "HI" position. Beginning with the adjustment of L-505 and L-506, repeat all adjustments. With a battery voltage of 13.6 VDC, the output power will be 25 watts. Plate current may be measured by examining the voltage across R-118. This voltage is converted to milliamperes plate current by multiplying the voltage by a factor of 100. Correct tuning will yield 170 ma. DC plate current for 25 watts output. Plate voltage will be 325 volts DC with correct tuning.

C. Adjust the audio generator to a frequency of 1500 Hz and set the output level to 100 mv (RMS). Key the transmitter and adjust R-507 for 5 kHz deviation as read on the deviation meter. Assure that the deviation meter is properly adjusted for this measurement.

D. Couple the frequency measuring device to the output of the transmitter in the manner described in the manual for your instrument. Adjust the appropriate trimmer capacitor to obtain the correct frequency for the channel in use. Access to the trimmer capacitor is to be made through the holes provided in the oscillator module cover.

E. An alternate method of frequency adjustment is available by connecting the frequency measuring device to TP-502. Measurements at this test point are at 1/4 the operating frequency. Note that the permissible error in cycles deviation from channel frequency is reduced to 1/4 when performing this measurement.
DO NOT ATTEMPT TO MEASURE FREQUENCY AT OTHER POINTS IN THE CIRCUIT AS DOING SO WILL LIKELY RESULT IN ERRONEOUS MEASUREMENTS DUE TO IMPROPER LOADING ON THE OSCILLATOR CIRCUIT.

GLADDING 25 PARTS LIST

ASSEMBLIES

Oscillator Module	3801-021
IF Module	3801-016
Audio Module	3801-017
Exciter Module	3801-019
Power Cable Assembly	2601-122
Microphone	1601-029
Cover (Top or Bottom)	2601-129
Cradle	2601-125
Front Panel Assembly	2601-128

MAIN CHASSIS ASSEMBLY

C-101	100 mf, 16V, electrolytic	0406-049
C-102, 103, 106	1000 mf, 16V, electrolytic	0406-057
C-104	.1 mf, 250 V, Metalized Film	0404-021
C-105, 108, 109, 111, 120, 124, 125	.001 mf, 1KV, disc ceramic	0401-015
C-107	.001 mf, 3KV, disc ceramic	0401-030
C-110	150pf, 500V, silver mica	0402-071
C-112	1-6pf, 400V piston trimmer	0403-058
C-113	18pf, 500V, silver mica	0402-053
C-114	330pf, 1KV, disc ceramic	0401-037
C-115, 116	3-13pf, 700V air variable	0403-045
C-117, 118	27pf, 500V, silver mica	0402-054
C-121	20mf, 450V, electrolytic	0406-029
C-122, 123	15pf, 500V, silver mica	0402-046
CR-101, 102, 103, 108	200V PIV, 1A, silicon diode	2102-014
CR-104, 105, 106, 107	600V PIV, 1A, silicon diode	2102-017
F-101	10A Fuse, Type 3AG	0801-006
FL-101	Crystal Filter	0516-002
J-101	6 pin female connector	2303-050
J-102	SO-239 VHF connector	2303-004
K-101	4PDT 12V Relay	1902-022
L-101	Bus Wire Coil	1201-242
L-102	Plate Coil	1201-240
L-103	Output Coil	1201-241

NOTE: APPLICABLE TO ALL VHF RADIOS

THE FOLLOWING INFORMATION APPLIES TO DYNAMIC PALM MICROPHONES UTILIZING A SPEECH AMPLIFIER BUILT INTO THE MICROPHONE ASSEMBLY. ERRORS EXIST BETWEEN LEAD COLOR CODING AS SHOWN ON THE SCHEMATIC DIAGRAM AND THE LEAD COLOR CODING OF THE MICROPHONE.

CARBON MICROPHONE OR HANDSET COLOR CODING	DYNAMIC MICROPHONE COLOR CODING
WHITE	RED
RED	BLUE
BLACK	BLACK & SHIELD
ORANGE	WHITE
GREEN	GREEN
YELLOW	BROWN

THIS DISCREPANCY IS TEMPORARY. FUTURE DYNAMIC MICROPHONES WILL CARRY THE COLOR CODING AS SHOWN IN MANUAL SCHEMATICS. THE ONLY MICROPHONES TO WHICH THIS APPLIES HAVE A TOTAL OF SEVEN CONDUCTORS INCLUDING THE SHIELD. R101, TO ACCOMPANY THIS MICROPHONE, SHOULD BE A 270 OHM, 1 WATT RESISTOR.

MAIN CHASSIS ASSEMBLY (Continued)

P-101	6 pin male connector	2304-046
PL-101	#222 Pilot Lamp	1801-013
Q-101, 102	2N1554 Transistor	2904-014
R-101	470 ohm, 1/2 W, carbon	2001-471
R-102	820 ohm, 1/2 W, carbon	2001-821
R-103	10 ohm, 5 W, wirewound	2011-023
R-104	47 ohm, 2 W, carbon	2003-470
R-105	5 ohm, 5 W, wirewound	2011-018
R-106	270 ohm, 1 W, carbon	2002-271
R-107, 108	330 ohm, 1 W, carbon	2002-331
R-109, 111	4.7 ohm, 1/2 W, carbon	2000-013
R-110, 112	.1 ohm, 5 W, wirewound	2011-010
R-113	47 ohm, 5 W, wirewound	2011-005
R-114	3K ohm, 10 W, wirewound	2011-024
R-115	1K ohm, 1/2 W, carbon	2001-102
R-116	100K ohm, 1/4 W, carbon	2025-104
R-117	27K ohm, 1/4 W, carbon	2025-273
R-118	10 ohm, 1/2 W, carbon	2001-100
R-119	7.5K ohm, 15 W, wirewound	2011-025
R-120	3.3K ohm, 1 W, carbon	2002-332
R-121	1.2K ohm, 5 W, wirewound	2011-026
R-122	10K ohm, 1/4 W, potentiometer	2008-051
R-123	100K ohm, 1/4 W, pot with DPDT	2008-078
RFC-101	1.5uH, RF Choke	1201-234
RFC-102	10uH, RF Choke	1201-146
RFC-103	.08uH, RF Choke	1201-248
S-101	3P3T single section wafer	2701-098
S-102	DPDT (Part of R-123)	--------
T-101	Audio Driver Transformer	1202-171
T-102	Audio Output Transformer	1202-170
V-101	12BY7A Driver Tube	2901-053
V-102	6883A Power Amplifier Tube	2901-052
Z-101	8.2V, 1 W, Zener Diode	2102-021
-----	Channel Marker Strip	0707-229
-----	Knob (Push On)	1301-062
-----	Knob, Large Concentric	1301-064
-----	Knob, Small Concentric	1301-065
	Pilot Lamp Socket	2301-052

MAIN CHASSIS ASSEMBLY (Continued)

-----	Exciter Cover	1510-056
-----	P. A. Cover	1510-057
-----	Crystal Cover	1510-054
-----	Rear Cover	1510-055
-----	Side Rail	1509-068
-----	3 inch Speaker	2501-020

IF MODULE (3801-016)

C-301, 302, 305, 309	.01mf, 50V, disc ceramic	0401-032
C-303	150pf, 500V, silver mica	0402-071
C-304	56pf, 500V, silver mica	0402-059
C-306	.001mf, 1KV, disc ceramic	0401-015
C-307	27pf, 500V, silver mica	0402-054
C-308, 310	.1mf, 250V, metalized film	0404-021
CR-301, 302	1N914A silicon diode	2102-029
Q-301, 302, 304, 305	MPS6517 Transistor	2904-038
Q-303	MPS706 Transistor	2904-033
R-301, 309	10K ohm, 1/4 W, carbon	2025-103
R-302	1.2K ohm, 1/4 W, carbon	2025-122
R-303, 308	1K ohm, 1/4 W, carbon	2025-102
R-304	1.5K ohm, 1/4 W, carbon	2025-152
R-305	470 ohm, 1/4 W, carbon	2025-471
R-306	33K ohm, 1/4 W, carbon	2025-333
R-307	4.7K ohm, 1/4 W, carbon	2025-472
R-310	27K ohm, 1/4 W, carbon	2025-273
R-311	15K ohm, 1/4 W, carbon	2025-153
R-312	3.3K ohm, 1/4 W, carbon	2025-332
R-313	39K ohm, 1/4 W, carbon	2025-393
T-301	10.7 mHz IF Transformer	1201-238
T-302	455 kHz IF Transformer	1201-167
Y-301	11.155 mHz crystal	0521-001
-----	Transistor Socket	2301-078
-----	Crystal Socket	2301-074

AUDIO MODULE (3801-017)

C-401, 403, 405, 419	.01mf, 50V, disc ceramic	0401-032
C-402, 404, 408, 410, 412 413, 421, 422	.1mf, 250V, metalized film	0404-021
C-406, 417	330pf, 1KV, disc ceramic	0401-037
C-407	.02mf, 1KV, disc ceramic	0401-023
C-409, 416, 418, 420	.001mf, 1KV, disc ceramic	0401-015
C-411	.005mf, 1KV, disc ceramic	0401-018
C-414	330mf, 10V, electrolytic	0406-059
C-415	100mf, 16V, electrolytic	0406-049
C-423	1.5mf, 250V, metalized film	0404-030
CR-401, 402	1N914A silicon diode	2102-029
IC-401	CA3011 Integrated Circuit	2904-042
Q-401, 402, 404, 405	MPS2716 Transistor	2904-034
Q-403	MPS706 Transistor	2904-033
R-401	1K ohm, 1/4 W, carbon	2025-102
R-402, 405	100K ohm, 1/4 W, carbon	2025-104
R-403, 409, 423	47K ohm, 1/4 W, carbon	2025-473
R-404	470K ohm, 1/4 W, carbon	2025-474
R-406	4.7K ohm, 1/4 W, carbon	2025-472
R-407	39K ohm, 1/4 W, carbon	2025-393
R-408, 415, 418, 421	22K ohm, 1/4 W, carbon	2025-223
R-410	180K ohm, 1/4 W, carbon	2025-184
R-411	3.9K ohm, 1/4 W, carbon	2025-392
R-412	220 ohm, 1/4 W, carbon	2025-221
R-413	4.7 ohm, 1/4 W, carbon	2000-019
R-414	100 ohm, 1/4 W, carbon	2025-101
R-416, 420	470 ohm, 1/4 W, carbon	2025-471
R-417	120K ohm, 1/4 W, carbon	2025-124
R-419	10K ohm, 1/4 W, carbon	2025-103
R-422	15K ohm, 1/4 W, carbon	2025-153
RFC-401	120uH, RF Choke	1201-040
T-401, 402	455 kHz IF Transformer	1201-167
-----	Transistor Socket	2301-078

OSCILLATOR MODULE (3801-021)

C-202, 216	8pf, 500V, silver mica	0402-049
C-205, 213	5pf, 1KV, NPO, Disc ceramic	0401-014
C-209, 210, 211, 227	.001mf, 1KV, disc ceramic	0401-015
C-220	2pf, 500V, tubular ceramic	0401-075
C-222, 238	.01mf, 50V, disc ceramic	0401-032
C-221	47pf, 500V, silver mica	0402-057
C-223	3.3pf, 500V, tubular ceramic	0401-043
C-224	68pf, 500V, silver mica	0402-048
C-225	56pf, 500V, silver mica	0402-059
C-226	.003mf, 1KV, disc ceramic	0401-016
C-228, 229, 230, 231, 232, 233	1-9pf, 500V, tubular trimmer	0403-059
C-234	27pf, N330, 500V, disc ceramic	0401-088
C-235	470pf, 100V, silver mica	0402-052
C-236	130pf, 500V, silver mica	0402-043
C-237	12pf, 500V, silver mica	0402-056
C-201, 203, 204, 206, 207, 208, 212, 214, 215, 217, 218, 219	Not assigned	
CR-201	1N270 germanium diode	2102-028
L-201, 202, 204, 206	VHF Coil (Orange)	1201-245
L-203	VHF Coil (Yellow)	1201-246
L-205	10.7 mHz IF coil	1201-238
Q-201, 203, 204	MPS-3563 Transistor	2904-039
Q-202	MPF-102 Field Effect Transistor	2904-049
R-222	470 ohm, 1/4 W, carbon	2025-471
R-206, 223, 228	1K ohm, 1/4 W, carbon	2025-102
R-207, 213, 219	10 ohm, 1/4 W, carbon	2025-100
R-208	2.2K ohm, 1/4 W, carbon	2025-222
R-209	3.9Kohm, 1/4 W, carbon	2025-153
R-210, 215, 224	220 ohm, 1/4 W, carbon	2025-221
R-214	5.6K ohm, 1/4 W, carbon	2025-562
R-220, 221, 225, 227	10K ohm, 1/4 W, carbon	2025-103
R-226	100 ohm, 1/4 W, carbon	2025-101
R-201, 202, 203, 204, 205, 211, 212, 216, 217, 218	Not assigned	
RFC-205	.12uH RF Choke	1201-243
S-201	Channel Selector Switch	2701-100

OSCILLATOR MODULE (Continued)

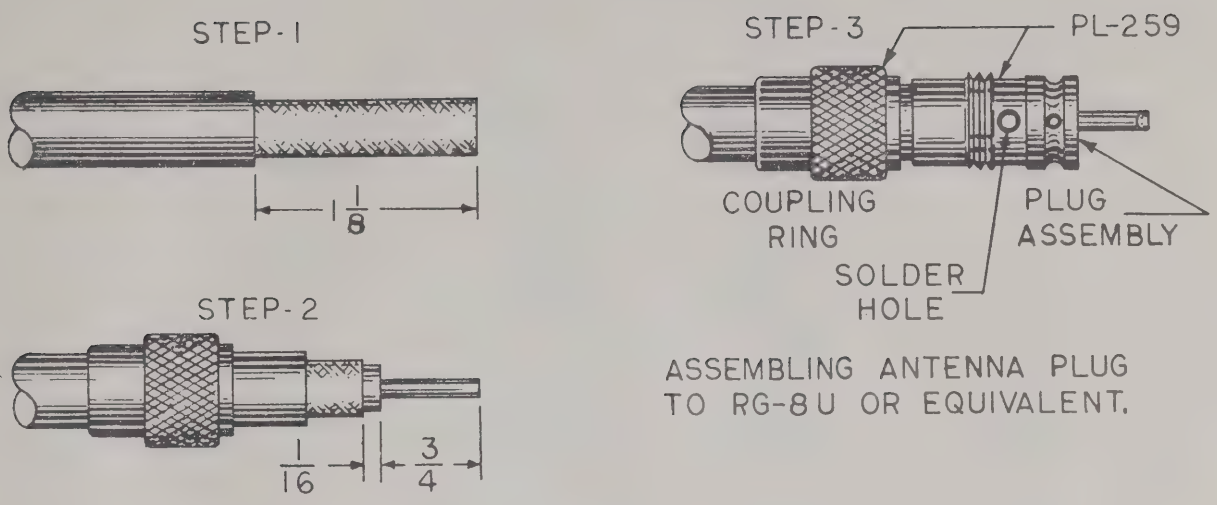
Y-201, 202, 203, 204, 205, 206	Receiver Crystal	0527-series
Y-207, 208, 209, 210, 211, 212	Transmitter Crystal	0526-series
-----	Transistor Socket	2301-078
-----	Crystal Socket	2301-074

EXCITER MODULE (3801-019)

C-501	.001mf, 1KV, disc ceramic	0401-015
C-502	.1mf, 250V, metalized film	0404-021
C-503	.47mf, 250V, metalized film	0404-020
C-504	.05mf, 100V, disc ceramic	0401-066
C-505, 507	.01mf, 250V, metalized film	0404-029
C-506	470pf, 100V, silver mica	0402-052
C-508	.033mf, 250V, metalized film	0404-024
C-509, 514, 516, 518, 519, 523 526, 530, 533, 534, 537	.01mf, 50V, disc ceramic	0401-032
C-510	30pf, 500V, silver mica	0402-047
C-511, 515	15uf, 40V, electrolytic	0406-060
C-512, 513, 522	47pf, 500V, silver mica	0402-057
C-517	.1mf, 16V, disc ceramic	0401-072
C-520	68pf, 500V, silver mica	0402-048
C-521	5-25pf, 350V, NPO trimmer	0403-057
C-524, 527	43pf, 500V, silver mica	0402-064
C-525, 529, 536	1pf, 500V, tubular ceramic	0401-041
C-528, 532	22pf, 1KV, disc ceramic	0401-045
C-531, 535	18pf, 500V, silver mica	0402-053
C-538	100pf, 500V, silver mica	0402-001
CR-501, 502	1N270 Germanium diode	2102-028
IC-501	CA3011 Integrated Circuit	2904-042
L-501	1H Toroid	1202-172
L-502, 503, 504	RF Coil (Green)	1201-247
L-504, 505	RF Coil (Red)	1201-244
Q-501, 502, 503, 504, 505	MPS706 Transistor	2904-033
R-501	1.5K ohm, 1/2W, carbon	2001-152
R-503	560 ohm, 1/2 W, carbon	2001-561
R-502	220ohm, 1/4 W, carbon	2025-221
R-504,	82 ohm, 1/4 W, carbon	2025-820
R-505, 508, 526	2.2K ohm, 1/4 W, carbon	2025-222
R-506, 509, 513	10K ohm, 1/4 W, carbon	2025-103

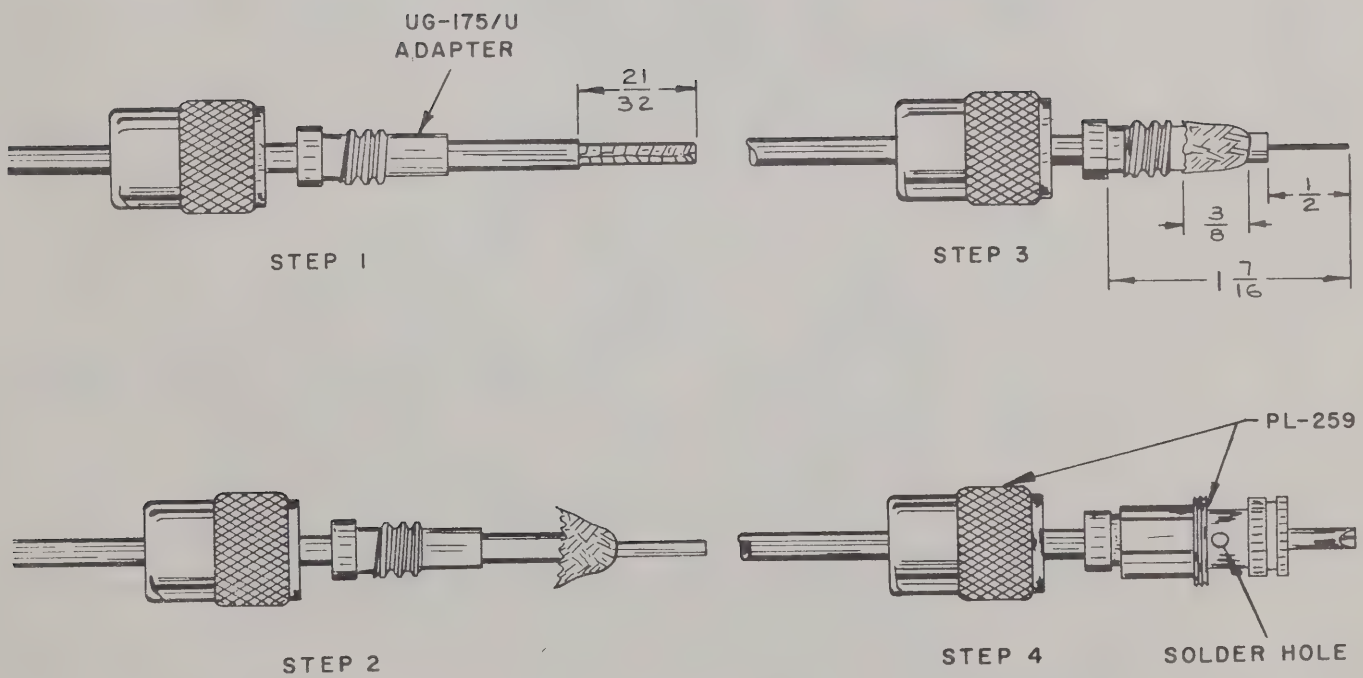
EXCITER MODULE (Continued)

R-507	30K ohm, 1/4 W, trimpot	2008-076
R-510, 519, 522, 523	4.7K ohm, 1/4 W, carbon	2025-472
R-511	3.9K ohm, 1/4 W, carbon	2025-392
R-512	22K ohm, 1/4 W, carbon	2025-223
R-514, 518, 520, 524, 525 527, 528	100 ohm, 1/4 W, carbon	2025-101
R-517	22 ohm, 1/4 W, carbon	2025-220
R-515	470 ohm, 1/4 W, carbon	2025-471
R-516	1K ohm, 1/4 W, carbon	2025-102
R-521	150 ohm, 1/4 W, carbon	2025-151
R-529	100K ohm, 1/4 W, carbon	2025-104
R-530	39K ohm, 1/4 W, carbon	2025-393
RFC-501	1.5uH RF Choke	1201-239
-------	Transistor Socket	2301-078



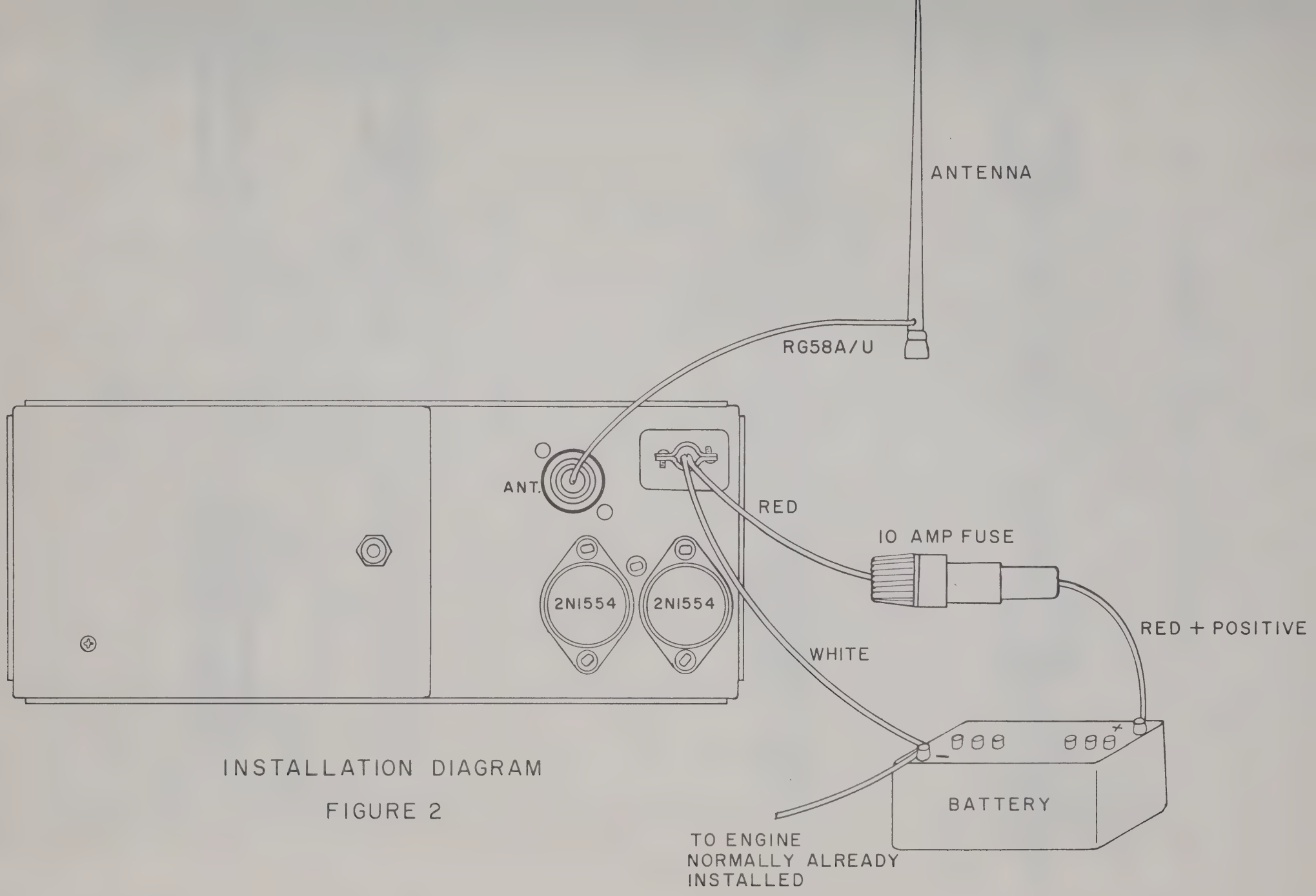
ASSEMBLING ANTENNA PLUG TO RG-8U OR EQUIVALENT.

FIG. 1A



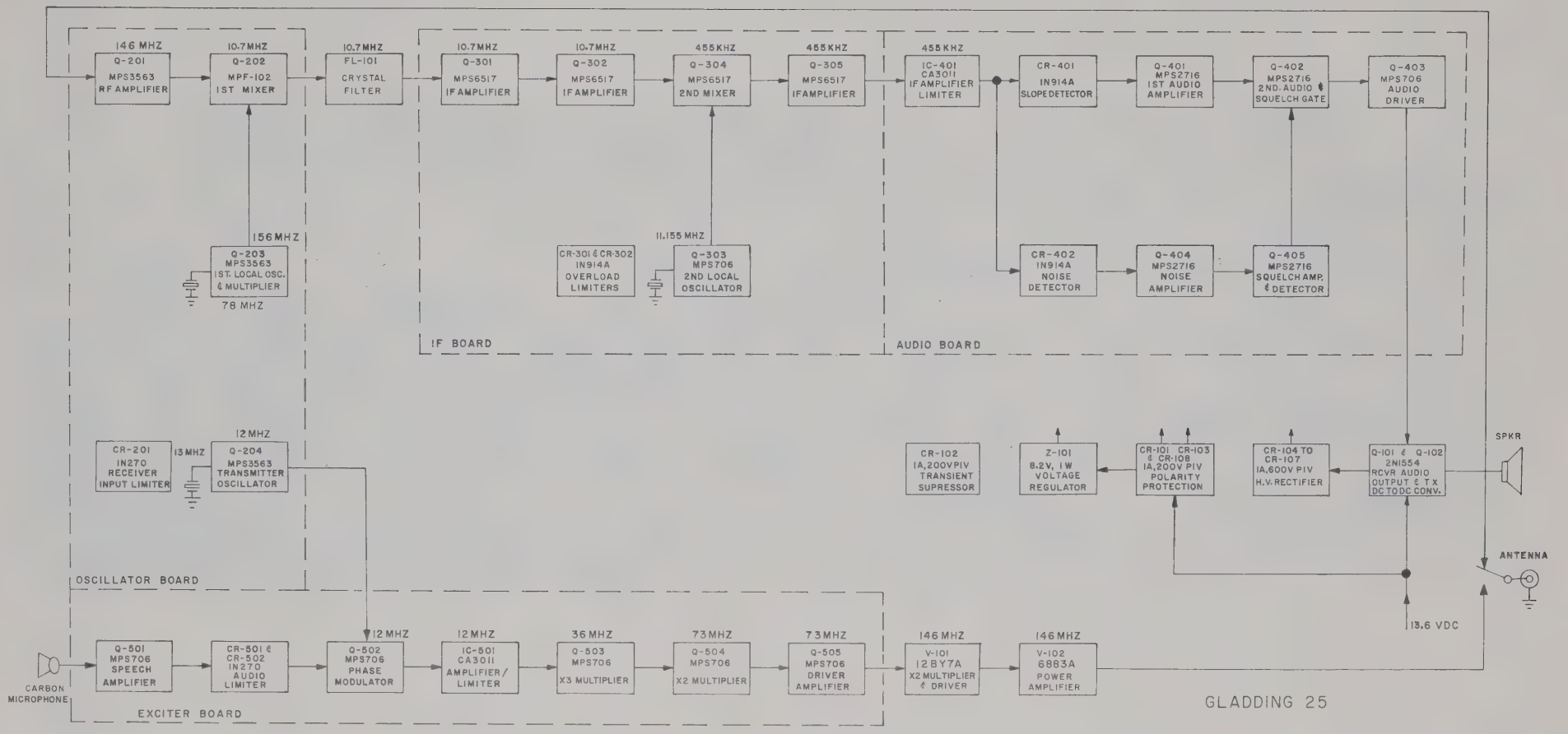
ASSEMBLING ANTENNA PLUG TO RG-58U OR OTHER 1/4" COAXIAL CABLE

FIG. 1B



INSTALLATION DIAGRAM

FIGURE 2


146 MHZ
Q-201
MPS3563
RF AMPLIFIER
10.7MHZ
Q-202
MPF-102
1ST MIXER
10.7MHZ
FL-101
CRYSTAL
FILTER
10.7MHZ
Q-301
MPS6517
IF AMPLIFIER
10.7MHZ
Q-302
MPS6517
IF AMPLIFIER
455KHZ
Q-304
MPS6517
2ND MIXER
455KHZ
Q-305
MPS6517
IF AMPLIFIER
455KHZ
IC-401
CA3011
IF AMPLIFIER
LIMITER
CR-401
IN914A
SLOPE DETECTOR
Q-401
MPS2716
1ST AUDIO
AMPLIFIER
Q-402
MPS2716
2ND. AUDIO &
SQUELCH GATE
Q-403
MPS706
AUDIO
DRIVER
156MHZ
Q-203
MPS3563
1ST. LOCAL OSC.
& MULTIPLIER
78 MHZ
CR-301 & CR-302
IN914A
OVERLOAD
LIMITERS
11.155 MHZ
Q-303
MPS706
2ND LOCAL
OSCILLATOR
IF BOARD
CR-402
IN914A
NOISE
DETECTOR
Q-404
MPS2716
NOISE
AMPLIFIER
Q-405
MPS2716
SQUELCH AMP.
& DETECTOR
AUDIO BOARD
12MHZ
CR-201
IN270
RECEIVER
INPUT LIMITER
13MHZ
Q-204
MPS3563
TRANSMITTER
OSCILLATOR
CR-102
1A,200VPIV
TRANSIENT
SUPRESSOR
Z-101
8.2V, 1W
VOLTAGE
REGULATOR
CR-101 CR-103
& CR-108
1A,200V PIV
POLARITY
PROTECTION
CR-104 TO
CR-107
1A,600V PIV
H.V. RECTIFIER
Q-101 & Q-102
2N1554
RCVR AUDIO
OUTPUT & TX
DC TO DC CONV.
SPKR
ANTENNA
13.6 VDC
OSCILLATOR BOARD
Q-501
MPS706
SPEECH
AMPLIFIER
CR-501 &
CR-502
IN270
AUDIO
LIMITER
12MHZ
Q-502
MPS706
PHASE
MODULATOR
12MHZ
IC-501
CA3011
AMPLIFIER/
LIMITER
36MHZ
Q-503
MPS706
X3 MULTIPLIER
73MHZ
Q-504
MPS706
X2 MULTIPLIER
73MHZ
Q-505
MPS706
DRIVER
AMPLIFIER
146MHZ
V-101
12BY7A
X2 MULTIPLIER
& DRIVER
146MHZ
V-102
6883A
POWER
AMPLIFIER
CARBON
MICROPHONE
EXCITER BOARD

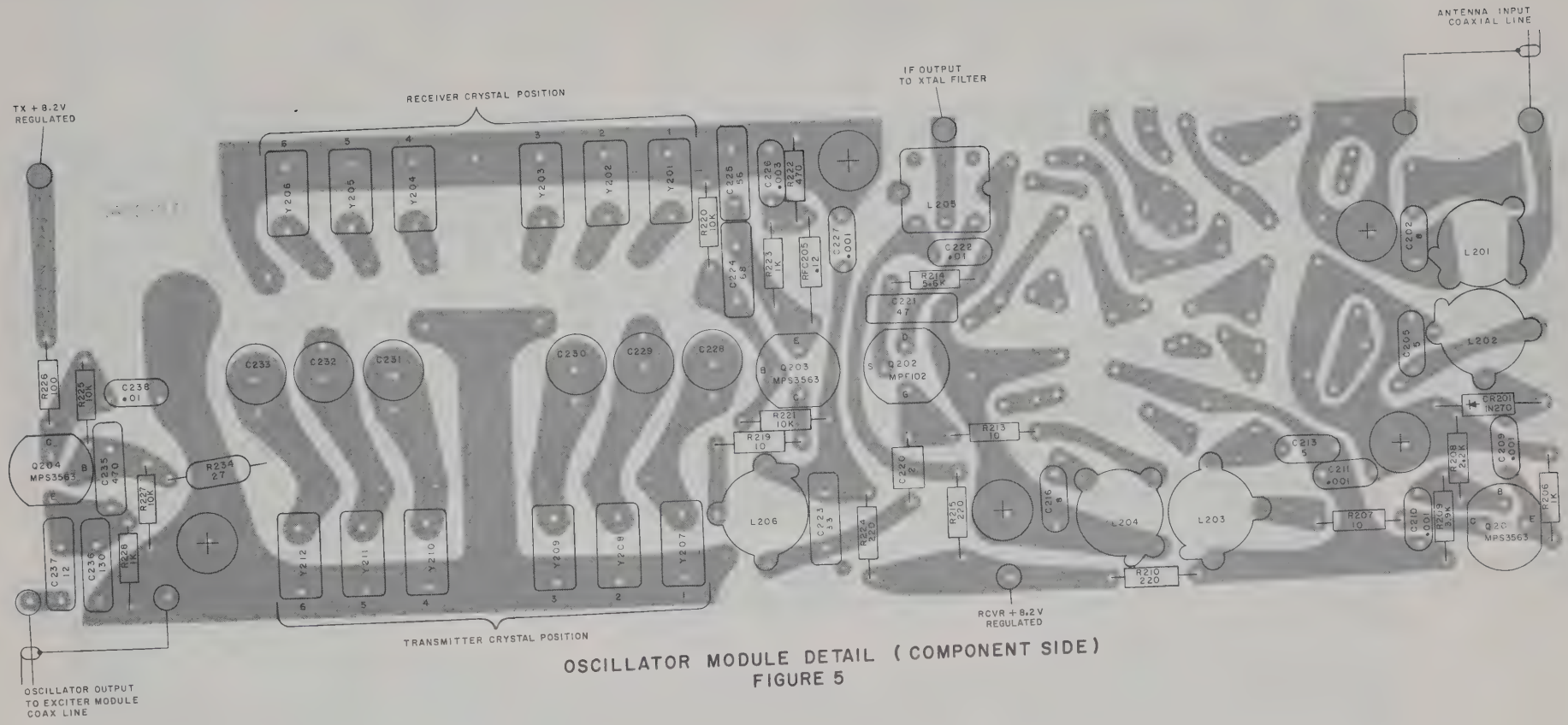
GLADDING 25

VOLTAGE CHART (Typical Values)

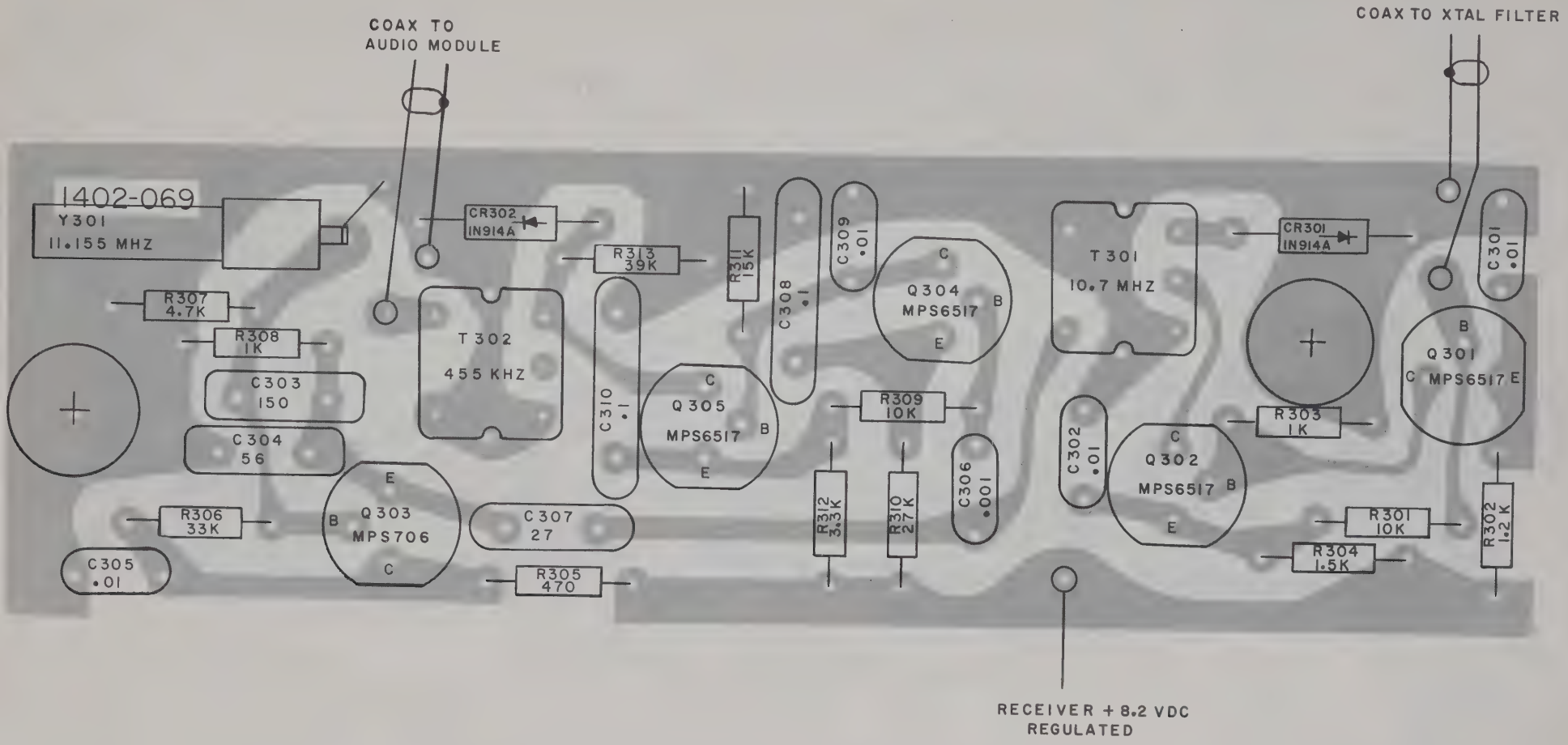
Circuit Element	1/E/S	2/B/G	3/C/D	4	5	6	7	8	9	10	11	12	CAP
V-101	GND	-17	GND	GND	13.0	NC	200	190	GND				
V-102	GND	13.6	225	GND	-40	GND	GND	GND					325
Q-101	10.8	10.7	GND										
Q-102	10.8	10.7	GND										
TP-101	-25												
Q-201	0.40	1.1	8.0										
Q-202	3.0	0	8.0										
Q-203	2.4	3.1	6.8										
Q-204	3.0	3.6	7.6										
Q-301	4.8	4.1	3.2										
Q-302	3.9	3.2	0										
Q-303	0.52	0.96	7.9										
Q-304	4.0	3.4	2.7										
Q-305	3.4	2.7	0										
Q-401	0.70	1.3	1.8										
Q-402	3.9	4.5	7.6										
Q-403	3.2	3.9	11.0										
Q-404	0.74	1.2	7.0										
Q-405	GND	0	7.2										
IC-401	2.0	2.0	2.0	2.1	6.6	NC	NC	GND	NC	6.6			
TP-401	2.1												
TP-402	1.0												
Q-501	.7	1.4	6.2										
Q-502	1.7	2.3	7.3										
Q-503	1.3	-0.7	7.2										
Q-504	0.8	-1.5	7.4										
Q-505	0.9	-1.4	10.0										
IC-501	2.1	2.1	2.1	2.2	6.6	NC	NC	GND	NC	6.6			
TP-501	1.3												
TP-503	0.8												
TP-504	0.9												
TP-505	-17												

Battery voltage 13.6 with volume control at minimum and squelch control off. Measurements on transmitter elements made with "TX POWER" switch in "HI" position and the push-to-talk switch depressed. Measurements at points with RF voltages present are made with a 100K ohm resistor in series with the VTVM. All measurements with respect to chassis ground. Channel switch in low segment. Measurements on Q-101 and Q-102 made in receive mode.

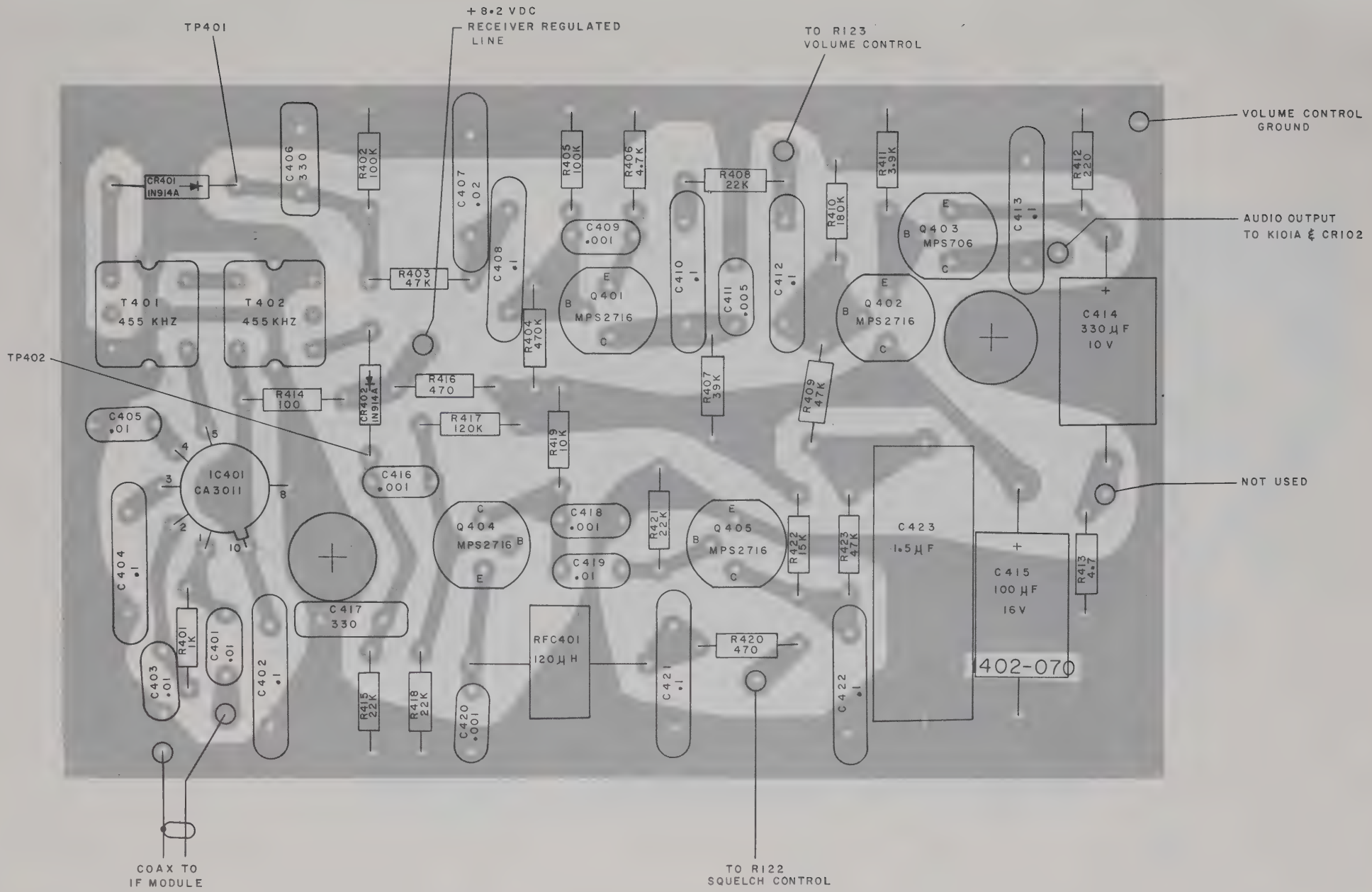
FIGURE 4



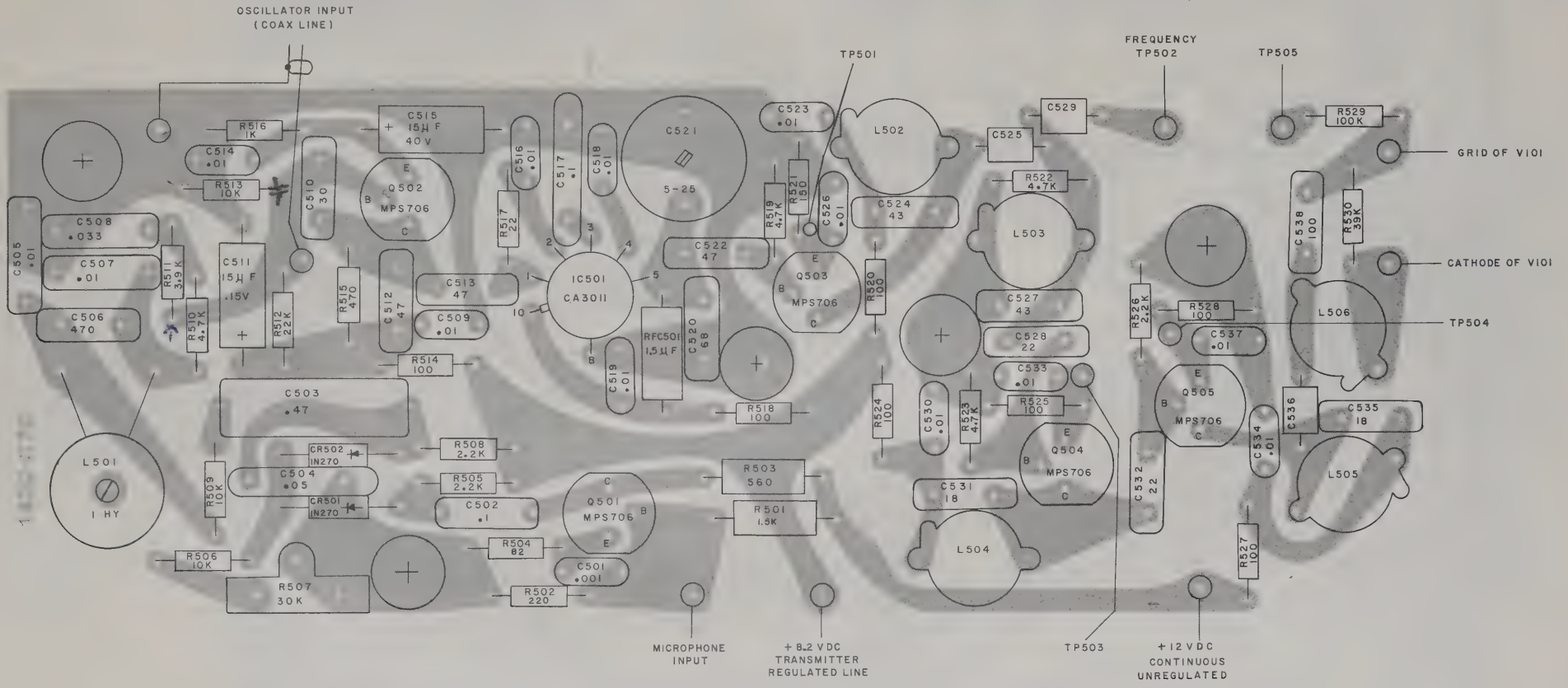
OSCILLATOR MODULE DETAIL (COMPONENT SIDE)
FIGURE 5



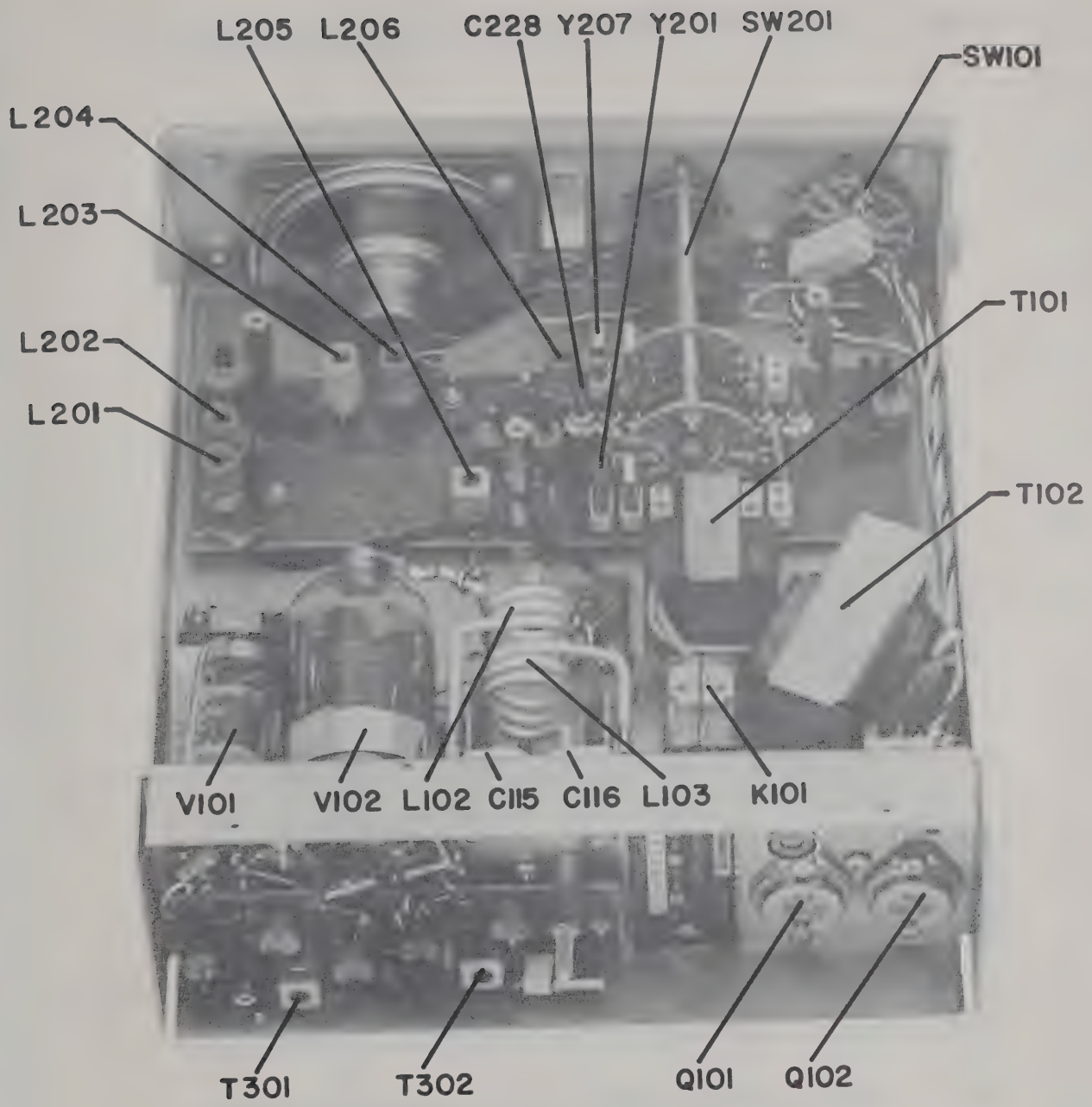
IF MODULE DETAIL (COMPONENT SIDE)
FIGURE 6



AUDIO MODULE DETAIL (COMPONENT SIDE)
FIGURE 7

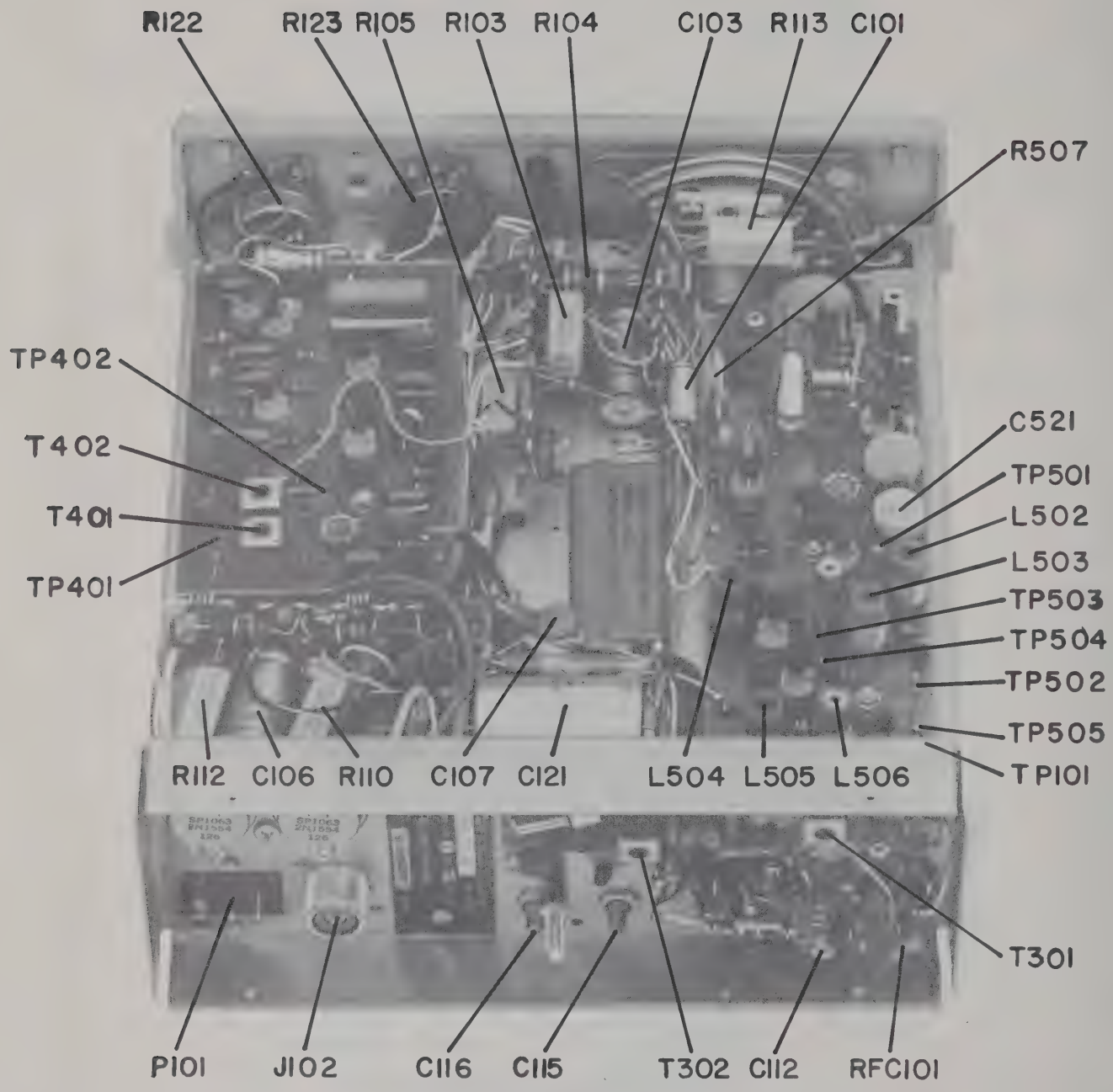


EXCITER MODULE DETAIL (COMPONENT SIDE)
FIGURE 8



TOP VIEW

FIGURE 9



BOTTOM VIEW

FIGURE 10

FACTORY WARRANTY POLICY

This electronic equipment, manufactured by Pearce-Simpson, is warranted in accordance with the following terms and conditions —

A. PEARCE-SIMPSON, WILL:

Replace any defective part of this equipment during the 90 day period following purchase.

Repair, at our factory without charge, this equipment, if a defect develops during the first 90 days following purchase. (This repair service is free only at the factory. No reimbursements can be made for non-factory repair charges.)

B. THE PURCHASER WILL:

Return the warranty registration card within 10 days of purchase.

Pay all transportation charges involved when equipment is returned for factory repair, provide information regarding nature of failure, and accept freight collect shipment of repaired equipment.

The above is void if equipment is modified or repaired without authorization, subjected to misuse, abuse, accident, water damage or other neglect, or has its serial number defaced or removed, or if more than 9 months has elapsed since factory shipment date to dealer.

No obligation is assumed by Pearce-Simpson, to update previously manufactured equipment.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

PEARCE-SIMPSON
DIVISION OF GLADDING CORPORATION

GLADDING PS AC POWER SUPPLY

SPECIFICATIONS:

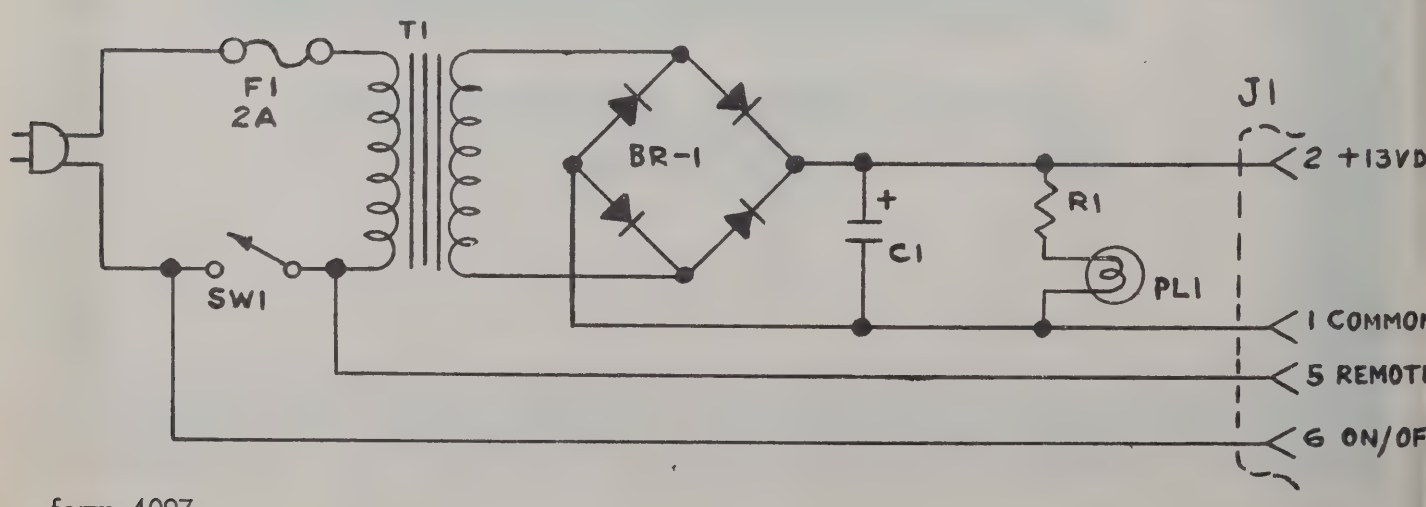
Input Voltage:	117 VAC @ 50 to 60 cycles
Output Voltage:	Nominal 12 volt DC system (10 amperes maximum)
Size:	8 1/2" wide x 3 3/4" high x 9 1/2" deep
Styling:	Compatible with Pearce-Simpson VHF FM base station transceivers

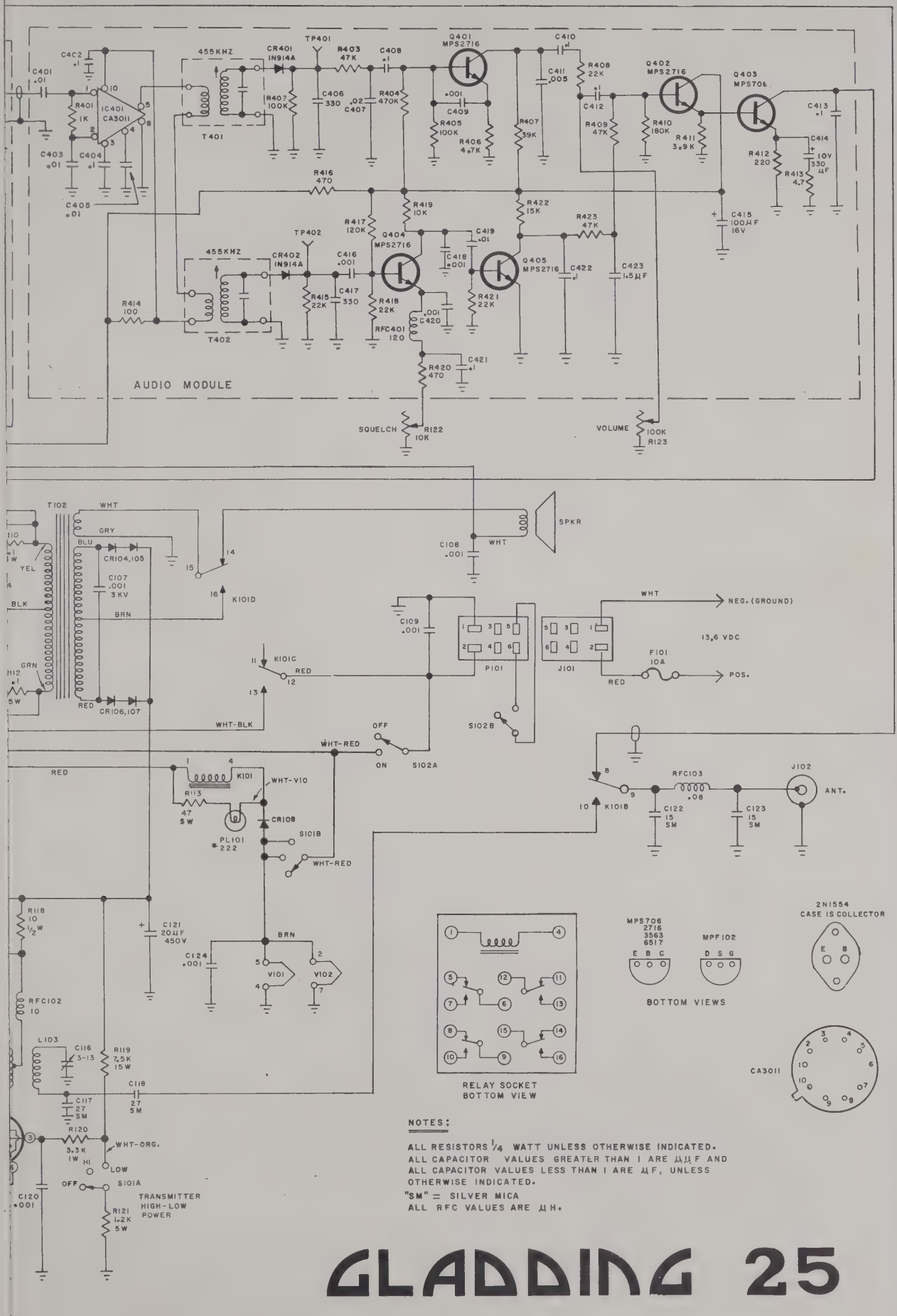
The GLADDING PS AC power supply is designed to power the Pearce-Simpson series of VHF FM transceivers in base station service. Mobile transceivers may be converted to base operation by the addition of the GLADDING PS power supply. Connections in the GLADDING PS and the base station unit are such that the power supply may be controlled by the ON-OFF switch of the transceiver. An extra set of rubber feet are provided with the GLADDING PS to be attached to the transceiver for desk placement of the unit.

The circuit of the GLADDING PS is a straight forward transformer - full wave bridge rectifier - capacity input filter system. The regulation provided by conservative design of components used in the GLADDING PS is ample for operation of the Pearce-Simpson series of transceivers.

PARTS LIST:

Symbol	Description	Part No.
C-1	18,000 mf, 25 WVDC electrolytic	0406-077
F-1	2 amp, type 3AG fuse	0801-025
----	Fuse Holder	0802-001
----	Rubber Feet	1119-003
T-1	Power Transformer	1202-173
PL-1	Pilot Lamp # 161	1801-023
R-1	27 ohm 1 watt resistor	2002-270
BR-1	Bridge Rectifier	2102-030
----	Lamp Socket	2301-051
J-1	6 Pin Female Connector	2303-050
----	Cover (Top or Bottom)	2601-129
----	Front Panel Assembly	2601-130





NOTES:

ALL RESISTORS 1/4 WATT UNLESS OTHERWISE INDICATED.
ALL CAPACITOR VALUES GREATER THAN 1 ARE μμF AND ALL CAPACITOR VALUES LESS THAN 1 ARE μF, UNLESS OTHERWISE INDICATED.
"SM" = SILVER MICA
ALL RFC VALUES ARE μH.

GLADDING PS AC POWER SUPPLY

SPECIFICATIONS:

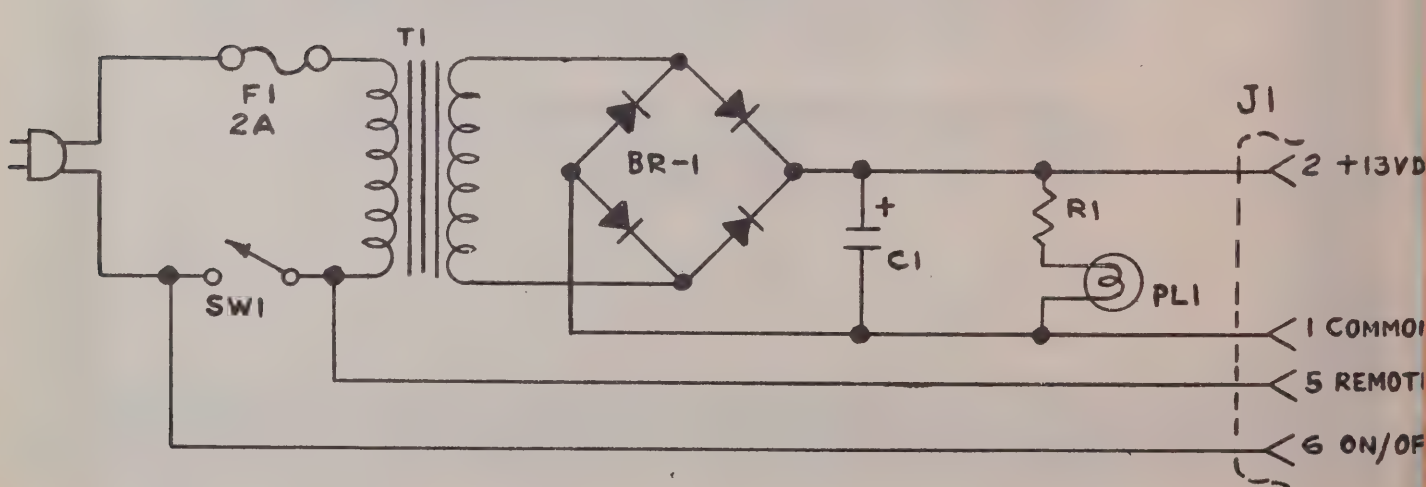
Input Voltage:	117 VAC @ 50 to 60 cycles
Output Voltage:	Nominal 12 volt DC system (10 amperes maximum)
Size:	8 1/2" wide x 3 3/4" high x 9 1/2" deep
Styling:	Compatible with Pearce-Simpson VHF FM base station transceivers

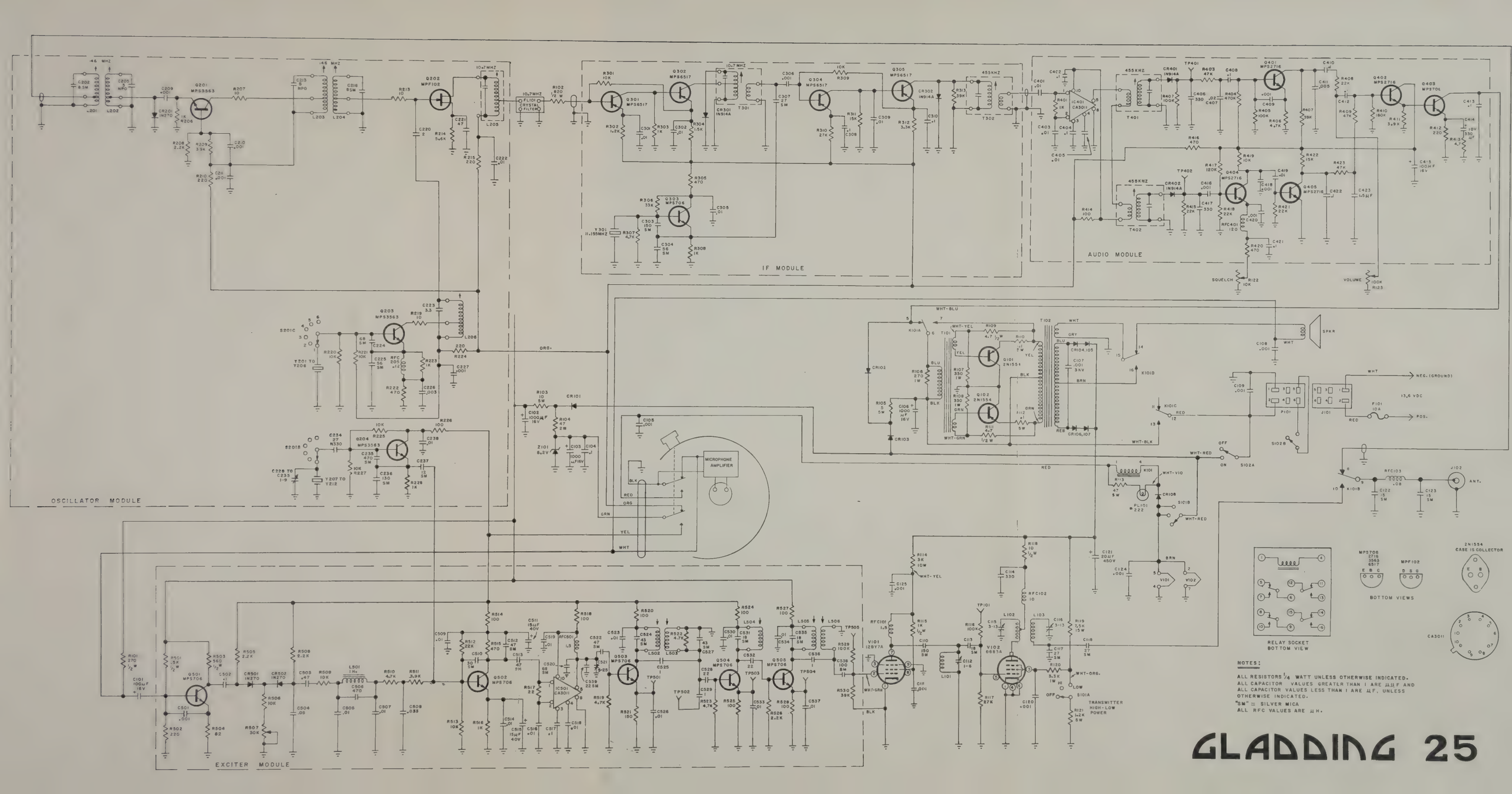
The GLADDING PS AC power supply is designed to power the Pearce-Simpson series of VHF FM transceivers in base station service. Mobile transceivers may be converted to base operation by the addition of the GLADDING PS power supply. Connections in the GLADDING PS and the base station unit are such that the power supply may be controlled by the ON-OFF switch of the transceiver. An extra set of rubber feet are provided with the GLADDING PS to be attached to the transceiver for desk placement of the unit.

The circuit of the GLADDING PS is a straight forward transformer - full wave bridge rectifier - capacity input filter system. The regulation provided by conservative design of components used in the GLADDING PS is ample for operation of the Pearce-Simpson series of transceivers.

PARTS LIST:

Symbol	Description	Part No.
C-1	18,000 mf, 25 WVDC electrolytic	0406-077
F-1	2 amp, type 3AG fuse	0801-025
----	Fuse Holder	0802-001
----	Rubber Feet	1119-003
T-1	Power Transformer	1202-173
PL-1	Pilot Lamp # 161	1801-023
R-1	27 ohm 1 watt resistor	2002-270
BR-1	Bridge Rectifier	2102-030
----	Lamp Socket	2301-051
J-1	6 Pin Female Connector	2303-050
----	Cover (Top or Bottom)	2601-129
----	Front Panel Assembly	2601-130




OSCILLATOR MODULE
IF MODULE
AUDIO MODULE
EXCITER MODULE
MICROPHONE AMPLIFIER
RELAY SOCKET BOTTOM VIEW
BOTTOM VIEWS
TRANSMITTER HIGH-LOW POWER
NOTES:
ALL RESISTORS 1/4 WATT UNLESS OTHERWISE INDICATED.
ALL CAPACITOR VALUES GREATER THAN 1 ARE µµF AND ALL CAPACITOR VALUES LESS THAN 1 ARE µF, UNLESS OTHERWISE INDICATED.
"SM" = SILVER MICA
ALL RFC VALUES ARE µH.
GLADDING 25

form

PEARCE-SIMPSON
DIVISION OF GLADDING CORPORATION
First in Outdoor Recreation Since 1816
P.O. BOX 800 BISCAYNE ANNEX, MIAMI, FLORIDA 33152
4701 N.W. 77TH AVENUE, MIAMI, FLORIDA 33166

BAUDOT DATA CODE

FIGURES	CCITT No. 2	—	?	:	WRU	3	!	&	£	8	BELL	(	)	.	,	9	0	1	4	'	5	7	=	2	/	6	+	BLANK	LETTERS	FIGURES	SPACE	CARRIAGE RETURN	LINE FEED
	U.S. BAUDOT	—	?	:	$	3	!	&	#	8	'	(	)	.	,	9	0	1	4	BELL	5	7	;	2	/	6	"						
	LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z						
BIT NUMBER	1	●	●		●	●	●				●	●						●		●		●		●	●	●	●		●	●			
	2	●		●				●		●	●	●	●				●	●	●			●	●	●					●	●			●
	3			●			●		●	●		●		●	●		●	●		●		●	●		●	●			●		●		
	4		●	●	●		●	●			●	●		●	●	●			●				●		●				●	●		●	
	5		●					●	●				●	●		●	●	●			●		●	●	●	●	●		●	●			

NOTE: FIGS - H MAY ALSO BE USED FOR MOTOR STOP

TRANSMISSION ORDER = bit 1 to bit 5 (Baudot)

AMATEUR RADIO CATALOG

HAL COMMUNICATIONS CORP.
BOX 365
URBANA, IL 61801
217-367-7373

DS3100 ASR

AUTOMATIC

SEND-RECEIVE TERMINAL

The DS3100 ASR is an electronic communications terminal for transmission and reception of coded communications using either the Baudot or ASCII teleprinter codes or the Continental Morse telegraphy code. The DS3100 is microprocessor controlled and provides many features to assist the operator. In particular, the DS3100 is the *first* multi-code terminal to provide full buffering of received and transmitted text, thus allowing composition of transmit text *while receiving*. This is the so-called "Automatic Send-Receive" (ASR) or "Buffered Send-Receive" (BSR) type of telecommunications terminal. The DS3100 also features programmable identification messages (a total of ten), internal real-time clock, on-screen display of the terminal status, an answer-back system for *all three codes,* and full keyboard control of the terminal as well as many many more conveniences. Particular attention has been given to the display and keyboard design to make for convenient and enjoyable operation. All terminal control functions are clearly marked on the custom triple-legend keytops, and the terminal's operating condition is clearly shown by on-screen *status indicators*. The DS3100 includes a new green P31 phosphor screen for ease of viewing. Try the DS3100 ASR for yourself and enjoy the operating features and convenience.

SPECIFICATIONS

Input/Output:

Baudot:	18-120 ma / 200 V current loop RS232C voltage levels
ASCII:	18-120 ma / 200 V current loop RS232C voltage levels Full 25 pin Modem connection
Morse:	0.5v p-p (600 ohm), 800 Hz audio input. Transistor switches to ground to key either negative voltage ("grid-block") or positive voltage ("cathode") circuits simultaneously.

Data Rates:

Baudot:	45, 50, 57, 74, 100 baud (60, 66, 75, 100, 132 wpm)
ASCII:	110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 baud (10, 15, 30, 60, 120, 180, 240, 480, 960 cps)
Morse:	Receive: automatically track 1 to 199 wpm Transmit: preset to 1 to 199 wpm in 1 wpm increments

Data Codes:

Baudot:	7.5 Unit code (1 start, 5 data, and 1.5 stop) A - Z, Ø - 9, -?:$!&#'().,BELL;/" LTRS FIGS CR LF Space Blank; Automatic FIGS/LTRS and CR/LF inserted as required.
ASCII:	110 baud: 11 unit code (1 start, 8 data, 2 stop) 150 - 9600 baud: 10 unit (1 start, 8 data, 1 stop) A - Z (upper and lower case or upper case only), Ø - 9, !"#$%&'()*+,-./:;<>=?@[]^_`{|~\, NUL SOH STX ETX EOT ENQ ACK BEL BS HT LF VT FF CR SO SI DLE DC1 DC2 DC3 DC4 NAK SYN ETB CAN EM SUB ESC FS GS RS US RUB OUT
Morse:	Continental Morse Code: A - Z, Ø - 9, .,?:;-'/()" AR AS BT ES KN SK

DS3100 ASR

Transmit Modes:

CONT:	Continuous mode; characters are transmitted as they are typed.
LINE:	Line mode; text is transmitted in complete lines, allowing editing of each line before transmitting.
WORD:	Word mode; text is transmitted one word at a time.
ASR:	All transmit text up to 50 lines may be precomposed and edited *while receiving* and transmitted at will; reverts to CONT, LINE or WORD modes after all precomposed text is transmitted.
FD/HD:	Full-Duplex or Half-Duplex operation; full-duplex allows *simultaneous active* receive and transmit operations.

Display Screen:

Format:	72 characters per line, 24 lines total; 12 lines receive and 12 lines transmit buffer display or all 24 lines receive buffer display. 5 × 7 dot matrix, Green P31 phosphor, 12 inch diagonal measure CRT.

Text Buffering:

Receive:	Up to 150 lines of storage of received text. Screen shows selected 12 (or 24) line segment of buffer with line numbers. In half-duplex, transmitted text is echoed into receive buffer as it is transmitted and displayed with "dim" intensity; full duplex transmit text is not echoed into the receive buffer.
Transmit:	Up to 50 lines of transmit text may be precomposed and stored in the transmit buffer. 12 lines of the buffer may be displayed with line numbers and screen position in the buffer may be changed. Transmit buffer may be pre-typed at any time with full edit features; selected lines of receive buffer text may be copied into the transmit buffer.

Local Output:

Printer Output:	Transmitted and received data is echoed out this port in ASCII code at RS232C voltage levels, regardless of the code being operated. Normally set to 300 baud, the data rate can be slowed internally to 110 baud.
Sidetone:	Sidetone audio in Morse transmit mode. Also serves as a bell tone. Volume is adjustable at the back panel.

Programmable Messages:

HERE IS:	Up to 10 different, 32 character HERE IS messages may be programmed and inserted into the transmit text as desired. HERE IS programming may include calls to other HERE IS segments, QBF test message, KY switch control and other features. The contents of HERE IS-1 and HERE IS-Ø are permanently saved in the non-volatile EAROM device.
IDENT:	IDENT key transmits contents of HERE IS-Ø in Morse code, regardless of the selected terminal code. IDENT may be called from a HERE IS message.
WRU:	Up to a 10 character WRU recognition text may be programmed. When the recognition text is received, switch KY1 is activated, HERE IS-1 transmitted, and KY1 deactivated with a delay before and after the HERE IS-1. Reception of the ASCII ENQ (or WRU; ØØØ1Ø1Ø1) will also trigger the WRU response. WRU may be used for automatic control of accessories such as tape recorder or transmitter.
EAROM:	EAROM (Electrically Alterable Read Only Memory) storage allows semi-permanent storage of critical parameters when power is disconnected. The contents of HERE IS-1, HERE IS-Ø, WRU code message, and terminal CODE, RATE, MODE, USOS, and SYNC status are all stored. Upon power application, the EAROM status and messages are set in the DS3100. The operator may change the parameters or the EAROM storage at will.
TIME:	Internal clock keeps time (24 hour format); an additional 16 characters may be programmed to give zone, date, or other information with the time. The TIME can be inserted into the transmit buffer or called from a HERE IS message.

Deluxe Features:

Word wrap-around	Full non-overprint; will not split a word at end of line.
USOS	On Baudot reception, reverts to LTRS case after reception of each SPACE character.
SYNC	Synchrounous idle to assist other station's reception. Fills time between transmitted characters with LTRS (11111) in Baudot, NUL (ØØØØØØØØ) in ASCII, and BT (-···-) in Morse.
CAPLK	Allows transmission of only capital letters or of both upper and lower case letters in ASCII code only. Upper or lower case letters are displayed as received.
KOS	Keyboard Operated Switch to control the transmit-receive circuitry of a radio installation.
KY1, KY2, KY3, KY4	Accessory switches that may be turned on or off by keyboard control or included in HERE IS message programs. KY4 is also controlled by the WRU response sequence. KY switches may be used to control external equipment.
Status Indicators	Key parameters or conditions of the DS3100 ASR are shown by 13 on-screen Status Indicator messages. Included are: TIME, CODE, RATE, MODE, USOS, SYNC, XMIT Buffer Status, WRU, KY 1234, FDX/HDX, CAP LK, IDENT, and PROG. The indicators occupy the far right-hand seven screen locations.
Keyboard	Arranged in a standard 52 key ASCII / typewriter format with SHIFT, CTRL, and FN keys. All terminal parameters are keyboard controlled by the FN plus second (or third) key. FN operations are shown by special front face legends on the keytops. Keyboard also features high-reliability key-switches and N-key rollover.
Test Messages	The standard QBF test message (THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG'S BACK Ø123456789) or alternate code patterns (RYRY in Baudot, U*U*U* in ASCII) may be transmitted with FN keys.

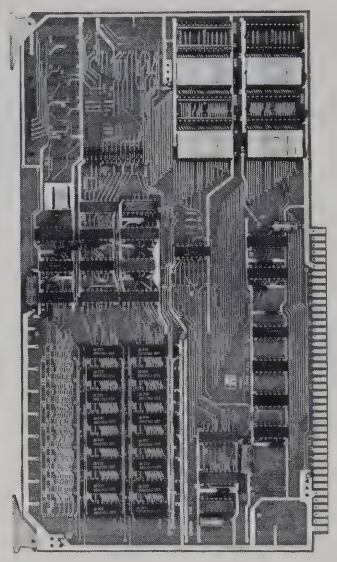
Mechanical Data:

Size:	13.5" W × 20.5" D × 15.25" H; 45 lbs net, 60 lbs ship (34.3 × 51.2 × 39.4 cm; 20.4 kg net, 27.2 kg ship)
Colors:	Castle tan and Chocolate Brown with color coordinated keytops and green characters on screen.
Power:	105-130 vac 50/60 Hz; 210-250 vac 50/60 Hz; 70 watts

MSO 3100

MESSAGE STORAGE OPTION FOR THE DS3100 ASR

The MSO 3100 Message Storage Option adds mass storage to the HAL DS3100 ASR terminal. Relatively long messages may be stored or replayed at will. The MSO 3100 adds approximately 450 lines of memory for message storage and retrieval. Messages can be written, recalled, or relayed through the DS3100 keyboard or by other users through the WRU feature of the DS3100. Control is accomplished through a series of commands which the user sends to the MSO 3100. Messages are stored in variable length files with user-assigned file names and passwords for file protection if desired. Other features include automatic TX/RX relay control, auxiliary equipment control commands, CW ID, and user help messages for added convenience. The MSO 3100 is particularly suited to composing and sending brag tapes and for automatic traffic handling. The MSO 3100 is factory installed and tested in your DS3100 ASR.



SPECIFICATIONS

Memory Size:
32 K RAM, 16 K ROM

Data Codes and Rates:
Since the MSO 3100 receives and transmits through the DS 3100 ASR, it will function in all three codes (ASCII, Baudot, or Morse). Its usefulness is most apparent in ASCII or Baudot codes where rates are normally higher and machines are synchronized from character to character for relatively error-free operation. User transmissions must match the code (and rate in the case of ASCII and Baudot) for which the terminal is set.

MSO Enable:
Addition of the MSO 3100 adds a third function to the WRU/Selective Call feature of the DS3100. The terminal will now cycle from an "all off" state to "WRU" to "SEL CAL" to "MSO ENB" (MSO Enable) when the Function-WRU key sequence is typed several times. The MSO feature is enabled by storing the desired activating code or call in the DS3100 WRU memory (up to 10 characters) just as in normal WRU operation. MSO ENB is then selected through the Function-WRU key sequence. With the MSO enabled, whenever the terminal sees the proper call appear in the receive buffer, the MSO feature becomes ACTIVE and awaits a valid MSO command.

Passwords:
Two separate passwords can be assigned to each file. One is to protect the file from being read and one to protect the file from being deleted. They are specified when the file is written. Only the local operator at the DS3100 keyboard has access to the list of passwords for the files, even though passwords may be specified remotely by another user.

Control Commands:
Following is a list of the commands which control the operation of the MSO 3100 with a brief explanation of each. Each command begins with a period (.) and must be left justified when received.

.DELETE (name)	Deletes a file specified by name. A file is the specific segment of memory allocated for a message. File length is any number of bytes up to the 32 K MSO capacity. Maximum name length is 16 characters.
.DIR	Lists the directory of current files in memory.
.ENDFILE	Indicates the end of a file being written.
.EXIT	Terminates the MSO ACTIVE mode, returning to MSO ENABLE.
.FILEHELP	Shows the formats of the file commands.
.HELP	Shows a list of all MSO commands with brief descriptions.
.KY1ON	Turns KY1 auxiliary control line on.
.KY1OFF	Turns KY1 off.
.KY2ON	Turns KY2 auxiliary control line on.
.KY2OFF	Turns KY2 off.
.PRINTON	Turns printer enable line (KY3) on.
.PRINTOFF	Turns printer enable line off.
.QBF	Sends two lines of "THE QUICK BROWN FOX . . ." test message.
.READ (name)	Reads a file specified by name.
.RYS	Sends two lines of "RYRYRYRYRY . . ."
.SDIR	Sends a short form of the directory including names and sizes of files.
.SEND	Local command for transmission of a file.
.WRITE (name)	Indicates the name and beginning of a file being written, and opens up an area in the MSO memory into which the text is entered.

Command Response
When a valid MSO command is received the general form of the response is:

1) KY4 on (auxiliary equipment or transceiver control)
2) CW ID (sends the contents of HERE IS-0 in Morse)
3) (Command action is performed here)
4) Time/date (sends the time and date from the DS3100 time memory)
5) KY4 off

Example:
Following is an example of the use of the MSO 3100 feature in the DS3100 terminal.

You load a brag tape into your DS3100 with MSO and want this to be available to anyone who calls. When you write the brag tape you select a password which protects the file from being erased by the user. Also, you load a message which you leave in the MSO for Jim Roberts, a good friend. In your WRU memory is "MSOXYZ." You have selected MSO ENB and KY4 is connected to KOS for transceiver control. (Note: In the example we have abbreviated the remote user's transmission to show only those portions applicable to MSO operation. If radio transmissions are being used, the user would naturally follow the complete call sequence including the use of station callsigns and Morse code identification, as well as the information for the MSO.) The user calls:

MSO 3100

SPECIFICATIONS

User Transmission	DS3100/MSO Response
(TX on) MSOXYZ (TX off)	(KY4 on and waits 1-2 seconds)
	[DE WB9XYZ] *(Sends the contents of HERE IS-0 in Morse code—You had previously stored this response in HERE IS-0)* THIS IS WB9XYZ MESSAGE CENTER *(Sends the contents of HERE IS-2 which you had previously stored)* .EXIT—TO EXIT MESSAGE STORAGE OPERATIONS. .HELP—TO PRINT COMMAND LIST 0845CST 12/01/80 NEXT? *(The MSO sends the present time and date from the DS3100 time memory.)* (KY4 off) *(Now the MSO awaits a response.)*
(TX on) .DIR (TX off)	(KY4 on) *(The user has asked for the directory listing from the MSO.)* [DE WB9XYZ] *(CW Ident.)* NAME CREATED SIZE STATUS BRAG1 0800CST 12/01/80 117 READ ROBERTS 0750CST 12/01/80 42 PRIVATE TOTAL OF 2 MESSAGES USING 159 BYTES. 30000 BYTES REMAIN. *(Note that the MSO only listed 2 message files in the directory. If there had been more messages stored they would have been listed also. The STATUS column tells the user that BRAG1 has a delete password and is open for anyone to read. ROBERTS has delete and read passwords.)* 0847CST 12/01/80 NEXT? (KY4 off)
(TX on) .READ BRAG1 (TX off)	(KY4 on) *(The user has asked to read the brag tape.)* [DE WB9XYZ] *(CW ident.)* *THIS IS WB9XYZ IN CHAMPAIGN, IL. TRANSCEIVER IS DRAKE TR-7 WITH THE HAL ST6000 DEMODULATOR AND DS3100 ASR WITH MSO FEATURE.* *0849CST 12/01/80 NEXT?* *(KYr off)*

Suppose that this was Jim Roberts calling. You had previously arranged the password "ZEBRA" with Jim and had used this in composing the "ROBERTS" file now in memory.

User Transmission	DS3100/MSO Response
(TX on) .READ ROBERTS/ZEBRA (TX off)	(KY4 on) [DE WB9XYZ] *(CW ident.)* JIM, OUR GOLF TEE TIME IS 8AM ON SATURDAY. 0855CST 12/01/80 NEXT? (KY4 off)
(Jim would like to leave a response.)	
(TX on) .WRITE REPLY	*(MSO immediately opens an area for writing a new file but does not respond.)*
RECEIVED YOUR MESSAGE AT 0855. J. ROBERTS .ENDFILE (TX off)	*(The message is copied into the file as written, and .ENDFILE closes the file.)* (KY4 on) [DE WB9XYZ] *(CW ident.)* FILE REPLY CREATED. USED 40 BYTES, 29890 BYTES REMAIN. 0859CST 12/01/80 NEXT? (KY4 off)
(TX on) .EXIT (TX off)	(KY4 on) [DE WB9XYZ] *(CW ident.)* MSO DEACTIVATED BYE (KY4 off) *(And the MSO returns from ACTIVE to ENABLE.)*
(The user signs off using callsigns and CW ID.)	

The example above shows how the MSO 3100 operates in general. The full capabilities of the MSO are limited only by the imagination of the user.

Mechanical Data:

General:	The MSO 3100 is a printed circuit board which is factory installed in the DS3100 terminal base.
Size:	12" L X 6.75" W (30.5 x 17.1 cm) Adds approximately 1 lb. (0.45 kg) to the net weight of the DS3100.
Power:	Derived from DS3100 ASR power supply. Less than 10 watts maximum.

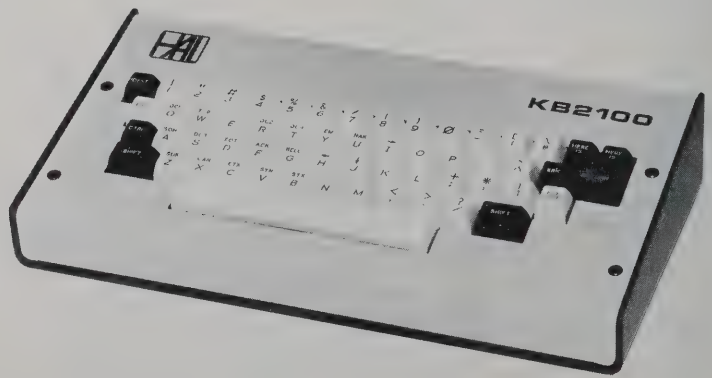
CUSTOM CABLE SETS

HAL can provide cable sets for interconnecting current HAL systems to most commercially available transceivers. Specify the model numbers and serial numbers of the HAL equipment and the transceiver to be used. Cable set C-1 is for the DS3100/ST6000 system (shipping weight 2 lbs.). Cable set C-2 is for the CT2100, DS2050, or Telereader systems (shipping weight 1 lb.). Contact your dealer or the factory for availability.

CT2100

COMMUNICATIONS TERMINAL

The CT 2100 is an electronic communications terminal designed for reception of Baudot and ASCII Radio Teleprinter (RTTY) signals as well as Morse code signals. With its companion keyboard, the KB2100, and a video monitor, the CT2100 becomes a complete transmit and receive data terminal. A total of *five* data demodulator combinations are available in the CT2100 including a CW demodulator, both high and low tone RTTY demodulators, and two standard modem tone sets for ASCII and computer use. All demodulator sections use the high-performance circuitry for which HAL demodulators are well known. The display of the CT2100 is organized in 24-line pages that can be either 48 - 72-character lines or 96 - 36-character lines for extra large characters. The display features "Smooth Scroll" of the lines rather than a vertical jump when lines of text are moved on the screen. This is a new HAL development, being introduced in the CT2100. The video display is normally white characters on a dark screen background, but may be reversed with a front panel switch to present black characters on a screen background. The CT2100 has been specifically designed so that it may be used either as a receive-only device or as a no-compromise KSR terminal with the KB2100 keyboard. All CT2100 controls are push buttons on the front panel. There are no confusing keyboard multi-key combinations to remember. The KB2100 keyboard is small and light and attaches to the CT2100 with a flexible coil cord, making it ideal for comfortable, lap-held use. Since the CT2100 is separate, it may be placed on a shelf or rack mounted, and only the keyboard need take up limited operating table surface. With the addition of the KB2100 keyboard, split screen transmit-receive operation is available so that transmit text may be composed while receiving. The CT2100 transmits in word mode if half duplex is selected or continuous mode if full duplex is selected. Split-screen operation may be defeated so that all lines are devoted to receiving. A status line may be front-panel selected to show current terminal operating conditions on the top line of the display. The CT2100 will also interface to a wide variety of external equipment through transmit and receive audio connections, tape recorder audio connections, and loop or RS232 data connections. Tuning is facilitated through 6 LEDs on the front panel and a video tuning indicator on the status line. The CT2100 rear panel is set up for fast and simple installation. All connectors except the KB2100 connection are standard phono connectors and are clearly labeled as to function. From its attractive appearance to its extreme versatility, the CT2100 is clearly the new wave in communications terminals.



CT2100

SPECIFICATIONS

Input/Output:

Audio: 0.5v. p-p, 600 ohm audio
Morse: 800 Hz ± 300 Hz
RTTY: 1000-3000 Hz, depends on tones chosen.
Tape: Input and output audio.
Monitor: Monitor output jack paralleling internal monitor speaker. May be used for headphones.

RS232: Full RS232C data levels for RTTY.

Loop: 18-120ma/200v maximum current loop.
External loop supply required to use external loop devices.
External loop transmit devices will key transmit tones and activate KOS.

Morse: Separate transistor switches to key both positive and negative voltage transmitter circuits.

Data Codes and Rates:

RTTY: Baudot (5 unit code) or ASCII (8 unit code): 45, 50, 57, 74, 110, 150, 300, 600, or 1200 baud.

Morse: 5 to 100 wpm, with weight control.

Modem:

Morse: Phase-lock loop; 800 Hz nominal center frequency; may be adjusted over 400 - 1200 Hz range; tracks a drifting signal ± 250 Hz of center frequency.

RTTY:

US Standard	Mark = 2125 Hz	
"High Tones":	Space = 2295 Hz	(170 Shift)
	= 2550 Hz	(425 Shift)
	= 2975 Hz	(850 Shift)
	CW ID = 2025 Hz	(all shifts)
IARU Standard	Mark = 1275 Hz	
"Low Tones":	Space = 1445 Hz	(170 Shift)
	= 1700 Hz	(425 Shift)
	= 2125 Hz	(850 Shift)
	CW ID = 1175 Hz	(all shifts)
"103 Modem"	Mark = 1270 Hz	
Standard	Space = 1070 Hz	
"202 Modem"	Mark = 1200 Hz	
Standard	Space 2200 Hz	

Transmit audio tone frequencies are automatically set with demodulator switches to correspond to receive tones to assure true transceive frequency matching.

Display:

Video: Standard RS170, 1.0 v. p-p, 72 ohm video output, 6 or 3 MHz BW

Screen: 24 Lines of 72 or 36 characters per line

Page Memory: 48 lines of 72 characters or 96 lines of 36 characters.

Polarity: Normal = white characters on dark screen background
Reverse = dark characters on white screen background

Split Screen: WITH KB2100 ONLY - bottom 12 lines of page 2 may be chosen for display of transmit pretype text. Text may be typed, displayed, and edited while receiving. In split screen mode, transmit text is in reverse video when normal video is selected for receive text and vice versa.

Status: Top line of display may be used to indicate CT2100 and KB2100 status; tuning indicator bar, code, rate (speed), USOS, and TX buffer condition are included in status line.

Scroll: HAL "Smooth Scroll" of line feeds; inactive when split screen is selected.

TX/RX Control: Select transmission in full or half duplex (FDX/HDX) modes, synchronous idle (SYNC), and manual or auto control of transmit/receive status of transceiver, keyboard operated switch (KOS).

Monitor: Internal audio monitoring system allows monitoring of either input or output audio signals on the internal monitor speaker (or rear panel headphone jack) with front panel volume control. Input audio switch position allows listening direct to receiver or tape signal. Output audio switch position allows listening to 800 Hz sidetone in Morse or to RTTY tones to be transmitted in Baudot or ASCII.

Indicators:

LEDs: Six LED indicators show Mark, Space, and center RTTY tuning; Morse center tuning, and KOS on-off status.

Screen: Top line of screen may be used for status indicator to show tuning bar for RTTY, code, rate (speed), USOS, and TX buffer condition.

Scope: Rear panel connections to vertical and horizontal amplifiers of X-Y RTTY oscilloscope for conventional crossed-loop indication (Oscilloscope NOT included with CT2100).

Keyboard: 58 keys plus space bar, ASCII keyboard arrangement. Special CW ID (IDENT), two HERE IS, RUB OUT, and BREAK keys included. The HERE IS messages are user programmable and 32 characters long. BREAK key sends key-down in Morse and Space condition in RTTY modes. RUB OUT allows error corrections. Highest quality commercial grade keyswitches are used for comfortable and reliable operation.

Message Storage (WITH KB2100 ONLY):
Two user-programmable HERE IS messages, each 32 characters long, automatically loaded on start-up with MSG2100 option.
2040 character, non-volatile EPROM storage may be divided in up to 7 255 character and on 191 character user-specified messages. EPROMs are factory or dealer programmed and are socketed so that several different EPROMs may be interchanged by the user.

Printer Output: All received data may be printed on an external printer (available as an option). The printer output is serial ASCII, RS232C standard, at a data rate of 110 to 1200 baud (normally set for 300 baud). Printer operates regardless of received data code (Morse, Baudot, or ASCII).

Front Panel Controls:

Data: Speed Increase, Speed Decrease, Mode selection (ASCII, Baudot, or Morse)

Display: Page cycle (to change pages), Line length cycle, Status line control, Normal or Reverse video, Unshift on Space, Clear Screen.

TX/RX Control: Full or Half Duplex, Synchronous Idle, Auto or Manual Transmit, KOS control.

Modem: RTTY or Modem tone select, High or Low tone select, Autostart control, RTTY shift select (170, 425, or 850 Hz).

I/O: RS232 or Audio Source select, Receiver or Tape Audio Source select, Normal or Loop control of transmit tones.

Monitor: Output or Input audio tone monitoring selection, Volume of monitoring tone, Power on-off switch.

Rear Panel Connectors:
Audio Input from Receiver, Audio Input from Tape, Audio Output to Transmitter, Audio Output to Tape, Monitor Audio Output, Mark and Space Scope Outputs, RS232 Input, RS232 Output, Loop Keyer Output, KOS Output, Negative and Positive CW Key Outputs, Printer Output, Video Output, KB2100 Keyboard connector, AC Power cord connector.

Mechanical Specifications:

CT2100 Cabinet: 16.75" x 3.625" x 10.375"
(17.00" wide with rack mounts)
42.55cm x 9.21cm x 26.35cm
(43.18cm wide with rack mounts)
16.0 lbs net; 19.0 lbs shipping
7.3 kg net; 8.6 kg shipping
Color: Light gray top and bottom with black front panel; red and blue push-buttons and front panel trim.

KB2100 Cabinet: 14.00" x 2.375" x 7.00"
35.56cm x 6.03cm x 17.78cm
4.5 lbs net; 7.0 lbs shipping
2.0 kg net; 3.2 kg shipping
Colors: Light gray top, dark gray bottom with black and white keytops.

Power Requirements: 110-130vac 50/60HZ; 220-260vac 50/60Hz; 30 watts

OPTIONS

CT2100 —Standard receive-only communications terminal.
KB2100 —Accessory keyboard to allow typing of transmitted text.
KG12 —Recommended 12" monitor. P31 Green phosphor CRT with removable smoked plastic screen cover. 120 VAC, 60 Hz, 39 Watts. Dimensions: 12.25" W x 12" D x 11.125" H, 16 lbs. net, 19 lbs. shipping.
MSG2100—Accessory non-volatile storage ROM for up to 2000 characters.
RM2100 —Rack mounting kit for CT2100. 1.5 lbs. net, 3 lbs. shipping.

RS2100

RTTY SCOPE

The HAL RS2100 RTTY Scope is an accessory that may be used with the HAL CT2100 Communications Terminal as a deluxe RTTY tuning indicator. The RS2100 includes a miniature 1 inch oscilloscope and gives the standard crossed-ellipse RTTY tuning indication. Also included in the RS2100 is a 175 volt, 60 ma dc loop supply that may be used with the CT2100 for direct connection to teleprinter machines. Although the cabinet of the RS2100 is designed to match that of the CT2100, the RS2100 may also be used as an external RTTY scope or loop supply for a number of other RTTY terminals, such as the DS2050, DS2000, CWR685, CWR6850, CWR670, CWR6700, ST5000, ST-5K, and ST-6K.

SPECIFICATIONS

RTTY Scope Input:

Sensitivity:	Approx. 10 v/in to 100 v/in (internally adjustable)
Impedance:	10k ohms or greater (varies with gain control)
Connectors:	Separate phono connections for horizontal (mark) and vertical (space) inputs.

RTTY Scope Controls:

Front Panel:	Horizontal Position (H); Vertical Position (V); Intensity (I); Focus (F); Power.
Internal:	X Gain; Y Gain; Astigmatism

RTTY Scope CRT: One inch diameter, green phosphor; 720 VDC maximum cathode to accelerator potential.

Loop Supply:

Open Circuit Voltage:	175 VDC, nominal (space)
Closed Circuit Current:	60 mA, nominal (mark)
Loop Key Input:	Switch to ground; compatible with CT2100 "EXT. LOOP" output or DS2050 "RTTY LOOP" output. Other equipment should employ an NPN transistor switch to ground with mark as the "on" state. Transistor must have voltage rating of 300 VDC or more and current rating of 100 mA or more.
Loop Outputs:	Two three-conductor ("stereo") jacks wired to accept either "stereo" or "mono" plugs. TTY machine connections must be isolated from ground.
Loop Indicators:	Mark and Space pilot lamps.

Power Requirements: 120 or 240 VAC, 50/60 Hz, 18 Watts.

Physical Description:

Size:	3.5"H x 8.25"W x 10.156"D (8.9 x 21.0 x 25.8 cm)
Weight:	9 lbs. (4.09 kg) net; 12 lbs. (5.45 kg) shipping
Color:	Light gray textured top and bottom, black front panel; matches appearance of CT2100 and KB2100.

RTTY REFERENCE

Amateur Radio RTTY Frequencies in the HF Band

80 Meters	3600–3650 KHz
40 Meters	7075–7100 KHz
20 Meters	14075–14110 KHz
15 Meters	21075–21100 KHz
10 Meters	28075–28100 KHz

Regardless of the band in use, Amateur RTTY is normally transmitted with the space tone being the lower frequency on the air. This requires that the transmitter be set for lower sideband with standard U.S. high tone RTTY equipment.

Some Commercial HF RTTY Frequencies of Interest

8023 KHz	AFP, Paris	425 shift, 50 baud
8105 KHz	Miami WX	850 shift, 74 baud
12223 KHz	VOA, Tangier	425 shift, 74 baud
14638 KHz	USIA, New York	425 shift, 74 baud
14974 KHz	AP, London	425 shift, 50 baud
16440 KHz	Miami WX	850 shift, 74 baud

More complete listings of press service frequencies may be purchased from:
Universal Electronics
1280 Aida Drive
Reynoldsburg, OH 43068
Attn: Thomas Harrington

Amateur RTTY Operations of Special Interest

The ARRL broadcasts bulletins from W1AW by RTTY on 7095 and 14095 KHz. The bulletins are first transmitted in Baudot code at 45 baud, 170 Hz shift. Immediately after the Baudot transmission, the same bulletin is transmitted in ASCII code at 110 baud, 170 Hz shift. The bulletins are transmitted by schedule as announced in *QST* magazine.

Message storage (MSO) nets are actively operating on 80, 40 and 20 meter frequencies. These nets provide a method of storing messages from one station to another for later retrieval or relay. Quite often general information for any interested operators is stored in these "mailboxes."

RTTY DX operations can be found in the 20-meter band just about any time that band conditions allow.

Special Considerations When Operating RTTY

We at HAL highly recommed the use of sideband transmission of RTTY signals, with the transceiver in lower sideband position (except of the Drake TR-7, where the RTTY position is used). The operator should remember to keep the mic gain down low enough to prevent overheating the final transmit stage of the transceiver.

Current FCC regulations require that amateur radio transmissions on RTTY be either in ASCII or Baudot code with the following restrictions concerning data rate:

Frequency Range	Maximum data rate
3.500 to 21.250 MHz	300 baud
28.0 to 225 MHz	1200 baud
420 MHz up	19600 baud

Most Amateur RTTY operations are still carried on at 45 baud (60 words per minute) and 170 Hz shift in Baudot code. On the HF bands, the susceptibility to errors caused by noise increases with the data rate.

The FCC still requires that U.S. Amateur Radio stations provide identification in International Morse code. Identification requirements for RTTY operation are the same as those for any other mode of operation.

The ASCII Data Code

	7	0	0	0	0	1	1	1	1
	6	0	0	1	1	0	0	1	1
	5	0	1	0	1	0	1	0	1
4 3 2 1									
0 0 0 0		NUL	DLE	SPC	Ø	@	P	`	p
0 0 0 1		SOH	DC1	!	1	A	Q	a	q
0 0 1 0		STX	DC2	"	2	B	R	b	r
0 0 1 1		ETX	DC3	#	3	C	S	c	s
0 1 0 0		EOT	DC4	$	4	D	T	d	t
0 1 0 1		ENQ	NAK	%	5	E	U	e	u
0 1 1 0		ACK	SYN	&	6	F	V	f	v
0 1 1 1		BEL	ETB	'	7	G	W	g	w
1 0 0 0		BS	CAN	(	8	H	X	h	x
1 0 0 1		HT	EM	)	9	I	Y	i	y
1 0 1 0		LF	SUB	*	:	J	Z	j	z
1 0 1 1		VT	ESC	+	;	K	[	k	{
1 1 0 0		FF	FS	,	<	L	\	l	|
1 1 0 1		CR	GS	-	=	M	]	m	}
1 1 1 0		SO	RS	.	>	N	^	n	~
1 1 1 1		SI	US	/	?	O	_	o	DEL

ENQ = acknowledge
BEL = signal bell
BS = backspace (←)
CAN = cancel
CR = carriage return
DC1 = device control 1
DC2 = device control 2
DC3 = device control 3
DC4 = device control 4
DEL = (delete)
DLE = data link escape
ENQ = enquiry (WRU)
EM = end of medium
EOT = end of trans.
ESC = escape
ETB = end of block
ETX = end of text
FF = form feed (home)
FS = file separator
GS = group separator
HT = horizontal tab (→)
LF = line feed (↓)
NAK = not acknowledge
NUL = null
RS = record separator
SI = shift in
SO = shift out
SOH = start of heading
SPC = space
STX = start of text
SUB = substitute
SYN = synchronous idle
US = unit separator
VT = vertical tab (↑)

Note: "I" = Mark = Hole in punched tape

The Baudot Data Code

Bit Number 5 4 3 2 1	Letters	U.S. Figures	CCITT#2 Figures
0 0 0 0 0	BLANK	BLANK	BLANK
0 0 0 0 1	E	3	3
0 0 0 1 0	LF	LF	LF
0 0 0 1 1	A	-	-
0 0 1 0 0	SPACE	SPACE	SPACE
0 0 1 0 1	S	BELL	'
0 0 1 1 0	I	8	8
0 0 1 1 1	U	7	7
0 1 0 0 0	CR	CR	CR
0 1 0 0 1	D	$	WRU
0 1 0 1 0	R	4	4
0 1 0 1 1	J	'	BELL
0 1 1 0 0	N	,	,
0 1 1 0 1	F	!	!
0 1 1 1 0	C	:	:
0 1 1 1 1	K	(	(
1 0 0 0 0	T	5	5
1 0 0 0 1	Z	"	+
1 0 0 1 0	L	)	)
1 0 0 1 1	W	2	2
1 0 1 0 0	H	#	£
1 0 1 0 1	Y	6	6
1 0 1 1 0	P	Ø	Ø
1 0 1 1 1	Q	1	1
1 1 0 0 0	O	9	9
1 1 0 0 1	B	?	?
1 1 0 1 0	G	&	&
1 1 0 1 1	FIGS	FIGS	FIGS
1 1 1 0 0	M	.	.
1 1 1 0 1	X	/	/
1 1 1 1 0	V	;	=
1 1 1 1 1	LTRS	LTRS	LTRS

Note: FIGS-H (10100) may also be used for MOTOR STOP function.

"I" = Mark = Hole in punched tape

ANSWERS TO OFTEN-ASKE

"WHY WORK RTTY?"

RTTY is one of those quickly growing "specialized" forms of amateur communications. The attraction to its devotees is probably a mixture of the magic of modern digital communications coupled with the convenience of written rather than coded or voice communications. If you participate in the popular autostart nets, it's not even necessary to be home when receiving a RTTY message—the printer or display will record the text for you to read at your convenience. RTTY is very popular among "rag-chewers" and "engineers" alike; in fact, you get to do a bit of both. The rapid growth of digital electronics has carried over to both RTTY and the new home computer hobby. ASCII communications between ham computers lacks only final FCC approval. If your "bag" is chasing DX, what could be more satisfying than a DXCC certificate for all RTTY? There are several DX RTTY contests sponsored every year with heavy participation. So, rather than ask "Why?" ask "How?"

"WHAT DO I NEED TO WORK RTTY?"

A ham RTTY station needs a transmitter, receiver, and antenna just like any RF communications system, in addition to some "special boxes" to make the RTTY part work. Some considerations for the equipment are outlined below:

1. RECEIVER - TRANSMITTER

   The RTTY receiver and transmitter (or transceiver) should be stable, well calibrated, and capable of *EXTENDED TRANSMITTER OPERATION*. When you are transmitting RTTY, the full carrier is on for longer periods of time than for CW or SSB voice. So, check your manual and manufacturer for RTTY specifications and, if in doubt, reduce transmitter power somewhat. For HF work, a good SSB rig in LSB mode works well with RTTY tones (more on tones, later). Most VHF-FM transmitters work with RTTY, but avoid overloading the transmitter as mentioned above.

2. ANTENNA

   A good antenna will buy you the same benefits in RTTY as it does in other modes. One caution though, the traps on some antennas may not handle as much power in continuous RTTY operation as they do for CW or SSB voice. This can especially be true of trap yagi antennas for the HF bands.

3. RTTY DEMODULATOR

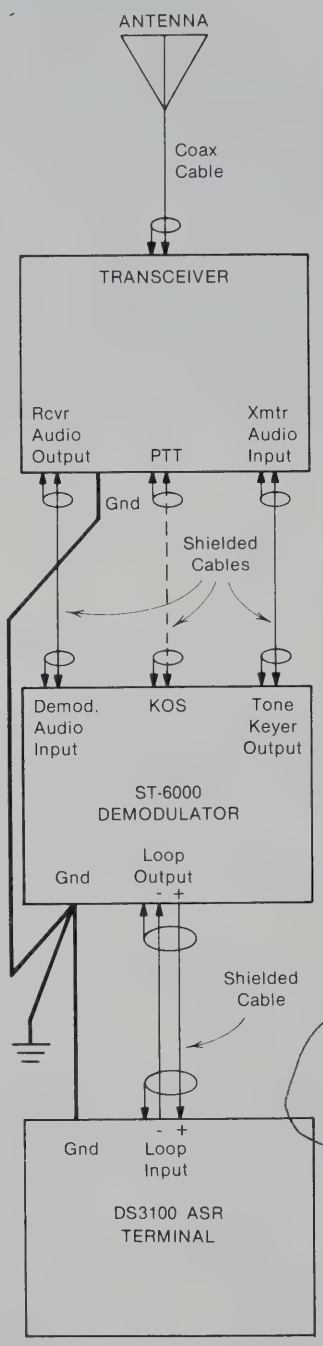
   The demodulator connects to the receiver audio output and converts the RTTY tones to keying pulses. The quality of your printed signal is determined more by demodulator performance than by any other portion of the system. Demodulators come in all shapes, sizes, and prices. HAL offers the feature-packed ST-6000 with active filters, scope, autostart, anti-space, ATC, DTH, and KOS, as well as the lower cost ST-5000. The popular ST-5 and ST-6 parts kits are also still available for the skilled technician.

4. TONE KEYER

   The tone keyer circuitry converts the keying pulses from your keyboard into audio tones to drive the transmitter. Since this circuitry is closely related to that of the demodulator, both are supplied in the same cabinet in all HAL demodulators.

5. TERMINAL

   The terminal is the device that prints or displays the received signals while allowing you to type your transmitted message. The terminal is sometimes divided into a keyboard and a printer or display section. The terminal can be as simple as an old surplus TTY machine or as exotic as the microprocessor controlled HAL DS3100 ASR terminal. An important feature of HAL Communications terminals is that ALL HAL RTTY EQUIPMENT IS LOOP COMPATIBLE WITH TTY MACHINES. This means that you can add HAL electronic equipment to your RTTY system at any time. The advantages of the HAL electronic terminals are many; ranging from lack of noise and oil (keeps the XYL happy and your nerves soothed) to automatic operator features such as real-time editing of typing errors, programmable identification message, and automatic carriage return/line feed operations. Also, the speed of the electronic terminal is easily changed with a front-panel switch. Machines require an expensive gear box or a manual change of gears to change speed. HAL offers the DS3100 ASR, DS2050, and CT2100. All HAL terminals operate with the standard ASCII computer code as well as with the normal amateur BAUDOT code.



"HOW DO I HOOK IT UP?"

Probably the most frightening thing to the RTTY beginner is the thought of all those wires that must be connected to make it work. A particularly complicated RTTY station can have a real "rats-nest" of wires, but it didn't start that way. Make connections in a logical and step-by-step manner and all will work well. All transceivers are slightly different, but, in general, you will have to make these connections:

1. GROUNDING

   Before making any other connections, decide approximately where your equipment will be located and run short, low-inductance ground wires (shield braid recommended) between the cabinet grounds of all equipment AND MACHINES. Do not defeat the AC safety ground on the HAL power cords; run separate RF grounds in addition to the AC safety ground. *LACK OF ADEQUATE RF AND SAFETY GROUNDS CAUSES MORE PROBLEMS IN RTTY INSTALLATION THAN ANY OTHER SOURCE.*

2. RECEIVER TO DEMODULATOR

   Use shielded cable to connect a 500 ohm audio output of the receiver to the demodulator audio input jack. If you do not have a 500 ohm output, the 4-8 ohm speaker output will work, but not as well; a speaker to 500 ohm line transformer would be a good part to add when possible.

3. TONE KEYER TO TRANSMITTER

   Use shielded cable to connect the tone keyer output of the demodulator to the transmitter audio input. Often, a rear-panel "phone-patch" or "auxiliary" input is provided. If not, connect directly to the microphone connector.

4. DEMODULATOR TO TERMINAL

   Use shielded cable to connect the terminal to the demodulator. Use the current loop connection for each. When connecting to a solid-state terminal, be sure to observe the proper polarity as indicated in the operator's manuals. Be extremely careful when wiring the loop circuit—potentially lethal voltages are present when the equipment is turned on (200 VDC @ 60 ma). Also, be sure that no part of the loop circuit is connected to chassis ground in machines or other equipment. All RTTY equipment is connected in series when the current loop output is used.

5. CONTROL CIRCUITS

   Since the control requirements differ with manufacturer, study your transceiver manual carefully to determine how to control the transmit-receiver function. Usually, you can control the push-to-talk (PTT) line through a pin on the microphone connector, a front panel switch, or a rear panel accessory connector. Initially, try to manually switch between transmit and receive until you are familiar with RTTY operation. Eventually, you will probably want to take advantage of the automatic Keyboard Operated Switch (KOS) feature of the DS3100 ASR and ST-6000. KOS is the RTTY equivalent to VOX; typing on the keyboard puts you into transmit mode. If you pause long enough, the KOS "drops-out" putting you back into receive mode. KOS is particularly convenient for short exchanges.

With the CT2100 and DS2050, since the demodulator and terminal are combined in the same package, the hookup is much simpler. The only cables are audio to and from the transceiver, ground, and KOS to PTT connections.

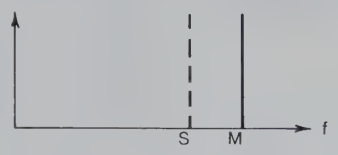
"WHAT IS THIS MARK AND SPACE BUSINESS?"

The RTTY signal from the terminal is a series of pulses. The amateur BAUDOT RTTY signal has 7 possible pulses for each character typed or printed, each transmitted one-after-another (serial). Each pulse can be either "ON" (current flow in the RTTY loop) which is called "MARK" or "OFF" (no current flow), the "SPACE" condition. To keep decoders synchronized, the first pulse of a character, the START pulse, is always a SPACE (current off); the last pulse, the STOP pulse, is always a MARK (current on). The 2nd through the 6th pulses can be either MARK or SPACE, depending upon the coding required for a character. The START and all 5 data pulses are the same length; the STOP pulse may be either equal to or longer than the others. The so-called computer ASCII code uses START and STOP pulses but has eight instead of five intermediate data pulses, thus allowing a greater number of characters to be encoded. Although all machines and HAL electronic terminals use pulses, the MARK and SPACE pulse conditions are converted into MARK and SPACE audio tones for easy radio transmission.

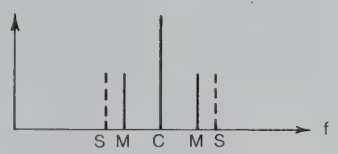
QUESTIONS ABOUT RTTY

"WHAT IS THE DIFFERENCE BETWEEN FSK AND AFSK?"

Transmitting RTTY signals via radio could be done like Morse code with on-off keying of the transmitter carrier. However, the interference received during off-times would give badly distorted printout. Rather, HF RTTY is transmitted with Frequency Shift Keying (FSK) so that the mark pulse condition corresponds to one radio frequency and the space to another. Amateur radio convention has it that the mark radio frequency is higher than space and that the separation or "shift" of the signal is standardized at 170 Hz or 850 Hz. (425 Hz shift is also used by commercial RTTY stations.) Most present-day amateur RTTY stations use 170 Hz shift exclusively. The FSK signal is received with the BFO turned on, giving two audio frequency tones for the mark and space conditions. The audio tones are, in turn, detected in the demodulator and the resulting pulses drive the display or printer. Note that changing the transmitter or receiver frequency (on purpose or through frequency drift) will change the audio output frequency to the demodulator. The HF system is therefore quite drift sensitive. Present HF equipment frequency stabilities are quite adequate for FSK RTTY, but it is only very recently that VHF equipment was available with similar stability. Therefore, VHF RTTY has traditionally been transmitted by first keying audio tones with the RTTY pulses and then using these tones as the audio modulation of an AM or FM VHF transmitter. This is called AFSK for Audio Frequency Shift Keying. Current amateur convention is to make the mark audio frequency lower than the space frequency by the amount of the shift. Since the RTTY data is audio modulation of the carrier, frequency drift of either transmitter or receiver is a lot less critical. The audio frequency of the tones transmitted is set to be the same as those in the receive demodulator.

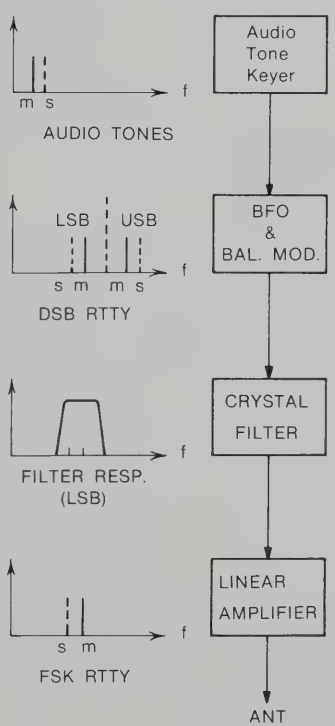


FSK RTTY



AFSK RTTY (AM)

The required radio frequency shift keying can be done in two different ways: shift the frequency of a transmitter oscillator directly with the RTTY pulses or use a SSB transmitter with audio tones. Direct FSK keying circuits are described in most amateur journals and are generally simple, but require modification of the equipment; generation of FSK with a SSB transmitter is as follows: If a Lower Sideband Transmitter (LSB) is driven with a 2125 Hz audio tone, the RF output of the transmitter will be at a frequency 2125 Hz *BELOW* the suppressed carrier frequency. A properly adjusted LSB transmitter will have *NO OTHER* output frequencies. If the input tone is changed to 2295 Hz (170 Hz shift), the RF frequency is now 2295 Hz BELOW the carrier frequency. Thus, audio tones into the LSB transmitter have produced FSK carriers out of the transmitter. Note that, because the LSB mode was used, the 2125 Hz standard mark tone for VHF AFSK has become the higher radio frequency. Thus, the same demodulator and tone keyer can be used for both VHF AFSK and HF FSK operation. Often, this use of audio tones with a SSB transmitter is mistakenly called "HF AFSK"—actually the resulting output is true FSK, IF the SSB transmitter has no spurious outputs (such as carrier or unwanted side-band). Most HF RTTY amateur radio stations use audio tones with a SSB transmitter. Although "standard" audio tones for VHF amateur operation have long been 2125 Hz for mark and 2975 Hz for space (850 Hz shift), limited audio frequency response of HF SSB transmitters and receivers has recently given rise to a second set of "standard" tones at lower frequencies ("Low-tones").



"HOW ABOUT HIGH- VS LOW-TONES?"

Historically, demodulator tones were set to 2125 Hz for mark and 2975 Hz for space reception of 850 Hz shift. When transmitter stability improved, 170 Hz shift was used and the space frequency changed to 2295 Hz (mark remained at 2125 Hz). These three tones were, and still are, a standard for U.S. Amateur RTTY. However, in the early 1960's, virtually all commercially available transmitters and receivers became filter-type SSB equipment with audio pass-band limited to speech frequencies, sometimes as narrow as 2.1 kHz (300 to 2400 Hz). Obviously, the 2975 Hz (850 Hz shift Space) tone will not pass-through such a filter and 850 Hz shift with these tones is not possible (although the 170 Hz shift is). Therefore, either the SSB equipment must be modified or different, lower-frequency tones must be used if 850 Hz RTTY shift is desired. Both approaches have their advantages and both are currently in use. The so-called "LOW-TONE" standard sets mark at 1275 Hz and space at 1445 Hz (170 Hz shift) or 2125 Hz (850 Hz shift), conforming to the European IARU standard. So, there are now two sets of "standard" tones, LOW and HIGH (as well as a myriad of others), all of which work *INTERCHANGEABLY* on HF RTTY. However, since the actual audio tone is transmitted for VHF AFSK operation, the two sets are *NOT COMPATIBLE IN VHF AFSK* applications. Current U.S. Amateur operation uses the HIGH TONES for VHF. Thus, to use a demodulator and keyer for both HF and VHF operation, it should be set-up for HIGH-TONE operation. Conversely, you may wish to have separate stations for HF and VHF, simplifying the cabeling, and providing simultaneous monitor/operation capability, as well as resolving the tone problem. The HAL ST-6000 and ST-5000 Demodulators are available for either HIGH or LOW-TONE operation.

"WHAT FREQUENCIES DO I USE FOR RTTY?"

HF RTTY Operation has evolved to heavy operation on the 80 and 20 meter bands (CW segments) with sporadic operation on other HF bands. 80 meter RTTY stations tend to operate between 3600 and 3650 kHz and 20 meter stations between 14.075 and 14.100 MHz. 170 Hz shift is used almost exclusively with mark being the higher radio frequency. 60 wpm (45 baud) is the most popular RTTY speed, but 100 wpm (74 baud) is gaining in popularity.

VHF RTTY operation in most areas is concentrated on 2 meter FM with 146.700 MHz being the popular operating frequency. Virtually all stations are now using the "High-tones," usually with 170 Hz shift. As with HF RTTY, 60 wpm (45 baud) is most popular on VHF. Some areas now have RTTY-only repeaters on 146.10/146.70 MHz.

"WHO DO I TALK TO ON RTTY?"

RTTY enthusiasts run the full range of ages and interests, but tend to be technically inclined. The typical RTTY'er is always modifying his station, likes to talk, and usually has more ideas than you have printer paper (or display screen)! Some operators are good typists; most aren't. The DS3100 ASR letters-fill and editing modes make even a poor typist look good. Recently, the home computer hobby has become quite popular with RTTY people and you may find a lot of help in debugging your programs if that's your interest. There are an increasing number of DX stations on RTTY.

"HOW MUCH DOES IT COST?"

RTTY is like any other hobby—it can cost as much or as little as you want it to. If you buy used machines and build kits or your own designs, the total RTTY cost can be quite low. Conversely, the DS3100 ASR and ST-6000 offer an *ULTIMATE* RTTY station that is expensive. Because all of the HAL RTTY products are current loop compatible, you can add devices as your interests (and pocketbook) indicate. For the beginner, HAL has the following recommendations:

1. DEMODULATOR

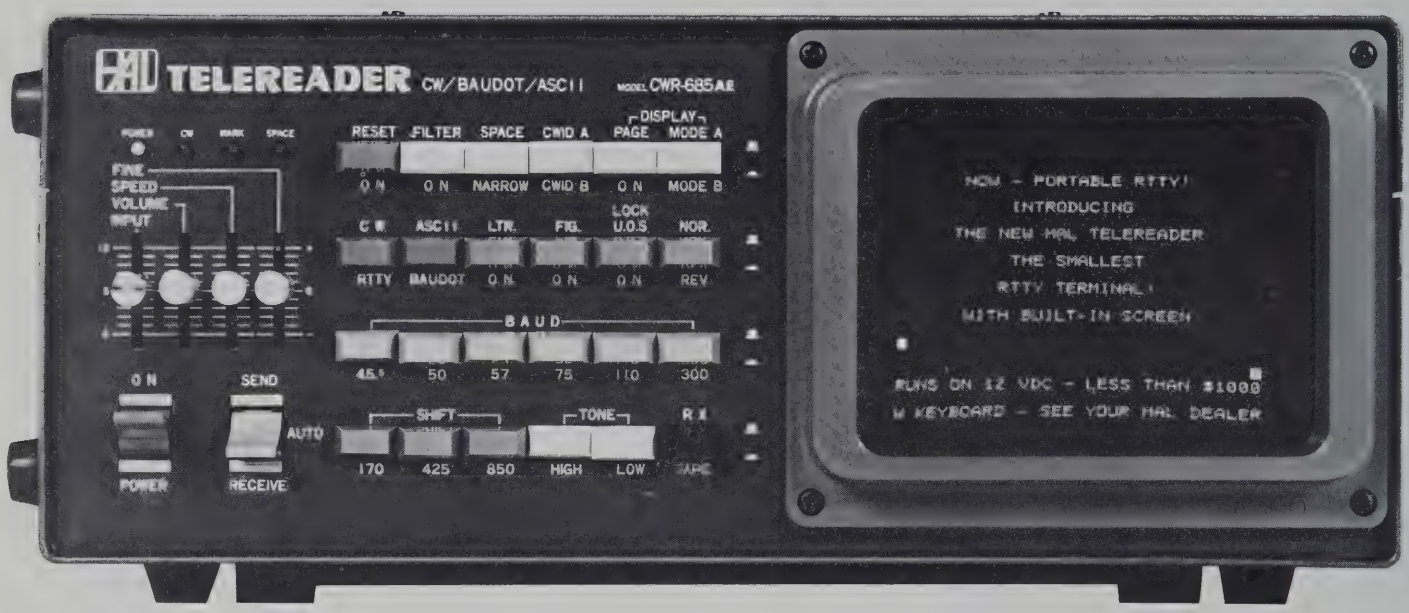
   Assuming you already have a good transceiver and antenna, your first major RTTY purchase should be a good demodulator. The HAL ST-5000 makes a particularly good, cost-effective unit. If you select a high-tone ST-5000, it will be usable for either VHF or HF (170 Shift) RTTY operation; if you are only interested in HF RTTY (for short-wave-listening to press stations, for example), the low-tone unit may be a better choice. Conversely, you may wish to "jump-in" and get the ST-6000 from the first. Either way, put high priority on a *GOOD* demodulator.

2. TERMINAL

   You can spend very little or a lot on the terminal. A surplus machine can often be acquired at a hamfest for little cash investment. However, by the time you figure out how it works, fix it, and buy parts and manuals the total cost may not be so low. If you do, you'd better be prepared with tools, oil, and patience. Newer machines require less work, but also cost more. On a feature-for-feature basis, either the DS2050 KSR, CT2100, or DS3100 ASR are more cost effective than other terminals presently available. Certainly a "solid" beginner's RTTY station would be the DS2050 KSR with a video monitor. For the more serious enthusiast, HAL offers the CT2100 or DS3100 ASR.

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373

CWR6850



TELEREADER KSR TERMINAL

The CWR6850 is a compact electronic communications terminal designed for reception and transmission of Baudot and ASCII Radio Teleprinter (RTTY) signals as well as Morse code (CW) signals. The CWR6850 includes a built-in green phosphor CRT display screen and RTTY and Morse demodulators. The very small size of the CWR6850 makes it particularly ideal for camper, boat, and other portable installations where space for equipment is limited. Since the terminal operates from 12 VDC, it may be easily used in locations where AC power is not readily available. The CWR6850 comes with a separate full but detachable keyboard. Without the keyboard, it is a convenient and small receive-only terminal; attach the keyboard and add transmitting capabilities. The screen of the CWR6850 is formatted in 20 lines of 32 characters per line; a total of four different screen pages may be selected. The internal RTTY demodulator allows selection of all three standard shifts (170, 425, 850) for either the "High Tones" (U.S. standard) or "Low Tones" (IARU standard). Transmit AFSK tones match the receive demodulator combination selected. Other transmit features include up to 15 lines of pretype on-screen buffer, automatic transmit/receive control (KOS), and a total of six 64-character programable HERE IS messages. A parallel ASCII printer output is provided for connection to a receive printer.

CWR6850

SPECIFICATIONS

Input/Output:

Audio: 20mV to 2 V rms, 8 ohm audio
Morse: 800 Hz center frequency
RTTY: 1000–3000 Hz
Tape: Input and output audio
External speaker and headphone jack

TTL: TTL data input and output jacks

Morse: Transistor switch for positive or negative voltages

Data Codes and Rates:

RTTY: Baudot (5-unit) or ASCII (8-unit) codes; 45, 50, 57, 75, 110, or 300 baud

Morse: 3 to 40 wpm receive
4 to 33 wpm transmit with weight control

Modem:

Morse: 800 Hz Active filter or phase-lock loop

US Standard	Mark = 2125 Hz	
"High Tones"	Space = 2295 Hz	(170 Shift)
	= 2550 Hz	(425 Shift)
	= 2975 Hz	(850 Shift)
IARU Standard	Mark = 1275 Hz	
"Low Tones"	Space = 1445 Hz	(170 Shift)
	= 1700 Hz	(425 Shift)
	= 2125 Hz	(850 Shift)

Transmit audio tone frequencies automatically set with demodulator switches to match receive tones. AFSK CW-ID tone shift available; front panel adjustable receive shift control.

Display:

Internal: 5 inch diagonal measure (3.25" × 4.25") green CRT;

Monitor: 20 lines of 32 characters per line; 4 display pages (total of 80 lines of display).
Page 1: 15 lines Rx data; 3 lines Tx buffer; 2 blank lines;
Page 2: 3 lines latest Rx; 15 lines Tx buffer; 2 blank lines;
Page 3: 3 lines latest Rx; 12 lines HERE IS text; 2 blank lines; 3 lines Tx buffer;
Page 4: 20 lines Rx data.

Polarity: Green characters on dark screen background.

External: Composite video, 1.0 V p-p, 75 ohms.

TX/RX Control: Automatic Keyboard Operated Switch (KOS) or manual keyboard or manual front panel switch control of station transmit-receive circuitry (plus voltage).

Indicators:

LED: Four front panel LEDs for power, CW Detect, RTTY mark and RTTY space indication.

Scope: Rear panel connections to "X-Y" tuning oscilloscope (Tuning oscilloscope NOT included).

Keyboard: 55 keys plus space bar, ASCII keyboard arrangement.

Message Storage: Six 64-character user-programmable HERE IS texts. CW ID may be included within HERE IS text.

Printer Output: Parallel, 12-wire Centronics—compatible printer output; 7 bit parallel ASCII code; prints text as it is received for either Baudot, ASCII, or Morse.

Front Panel Controls:

Switches: CLEAR ON, FILTER ON, SPACE/NARROW, MODE A/MODE B, AUTO ON, PAGE, ASCII/BAUDOT, CW/RTTY, FIG ON, LTR ON, U.S.O. ON, NOR./REV., 45.5, 50, 57, 75, 110, 300 (BAUD), 170, 425, 850 (SHIFT), HIGH TONE, LOW TONE, RX/TAPE, POWER ON, SEND/OFF.

Controls: INPUT (audio level), VOLUME (sidetone monitor), SPEED (CW transmit), SHIFT (RTTY).

Indicators: POWER, CW, MARK, SPACE.

Rear Panel:

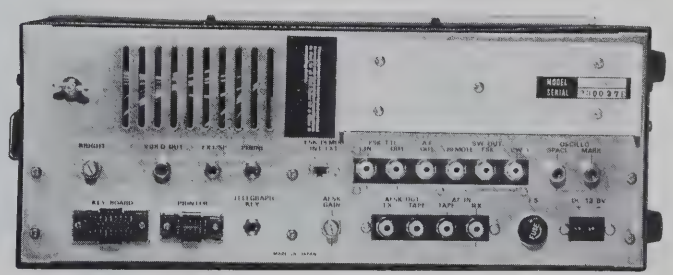
Controls: BRIGHT (CRT intensity), AFSK GAIN (transmit level).

Connectors: KEYBOARD, PRINTER, EXT SP, PHONE, TELEGRAPH KEY, FSK TTL IN, FSK TTL OUT, AF OUT, REMOTE, SW OUT FSK CW, AFSK OUT TX, AFSK OUT TAPE, AF IN TAPE, AF IN RX, OSCILLO SPACE, OSCILLO MARK, DC 13.8V.

Mechanical Specifications:

CWR6850: 12.75" × 5" × 11.75" (32.3 × 12.7 × 27.6 cm)
Keyboard: 13.75" × 2" × 7.25" (34.9 × 5.1 × 18.4 cm)
16.5 lbs net, 20 lbs shipping (incl. keyboard)
7.5 kg net, 9.1 kg shipping (incl. keyboard)

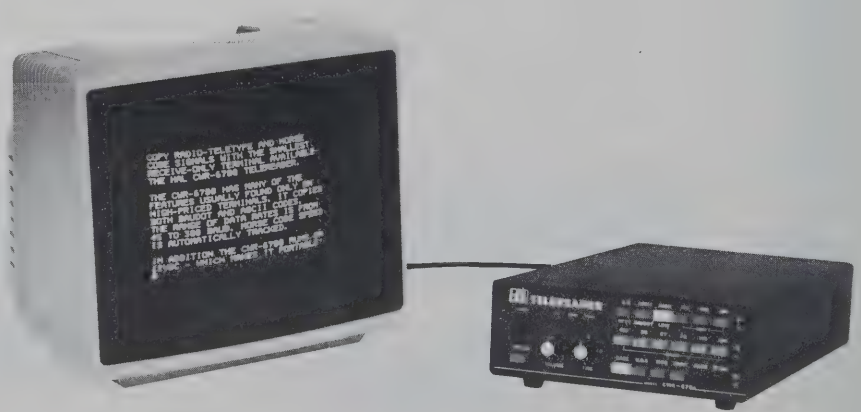
Power: 12 to 14.5 VDC (13.8 VDC nominal), 1.6 Amps.



CWR-6700

TELEREADER RO TERMINAL

The CWR-6700 is a compact electronic communications terminal designed for reception of Baudot and ASCII Radio Teleprinter (RTTY) signals as well as Morse code (CW) signals. The CWR-6700 includes built-in RTTY and Morse demodulators and video generation circuits. The very small size of the CWR-6700 makes it ideal for applications where space is limited. Since the terminal operates from 12 VDC, it may be easily used in locations where AC power is not readily available. The video output screen of the CWR-6700 is formatted in pages of 16 lines of 36 or 72 characters per line; a total of two different screen pages may be selected. The internal RTTY demodulator allows selection of all three standard shifts (170, 425, 850) for reception of "High Tones" (U.S. standard) or "Low Tones" (IARU Standard). A parallel ASCII printer output is provided for connection to a receive printer.



CWR-6700

SPECIFICATIONS

Input/Output:

Audio:	40mV to 2 V rms, 8 ohm audio Morse: 800 Hz center frequency RTTY: 1000–3000 Hz External speaker jack
TTL:	TTL data input jack

Data Codes and Rates:

RTTY:	Baudot (5-unit) or ASCII (8-unit) codes; 45, 50, 57, 75, 110, or 300 baud
Morse:	4 to 50 wpm receive

Modem:

Morse:	800 Hz Active filter	
RTTY:	US Standard	Mark = 2125 Hz
	"High Tones"	Space = 2295 Hz (170 Shift)
		= 2550 Hz (425 Shift)
		= 2975 Hz (850 Shift)
	IARU Standard	Mark = 1275 Hz
	"Low Tones"	Space = 1445 Hz (170 Shift)
		= 1700 Hz (425 Shift)
		= 2125 Hz (850 Shift)

Front panel adjustable shift frequency control.

Display:

Screen:	16 lines of 36 or 72 characters per line, switch selectable; 2 display pages (total of 24 different lines of display in 36 character mode, or 28 lines of display in 72 character mode). Page 1: 16 lines Rx data Page 2: 16 lines Rx data
Output:	Composite video, 1.0 V p-p, 75 ohms.

Indicators:

LED:	Four front panel LEDs for power, CW Detect, RTTY mark and RTTY space indication.
Scope:	Rear panel connections to "X-Y" tuning oscilloscope. (Tuning oscilloscope NOT included.)

OPTIONS

KG12:	Recommended 12" monitor. P31 green phosphor CRT with removable smoked plastic screen cover. 120 VAC, 60 Hz, 39 Watts. Dimensions 12.25"W x 12"D x 11.125"H, 16 lbs. net, 19 lbs. shipping.

Printer Output: Parallel, 12-wire Centronics — compatible printer output; 7 bit parallel ASCII code; prints text as it is received for either Baudot, ASCII, or Morse.

Front Panel Controls:

Switches:	CW/RTTY, BAUDOT/ASCII, HIGH/LOW, 170, 425, 850 (SHIFT), 45.5, 50, 57, 75, 110, 300 (BAUD), CASE, U.O.S., NOR, PRINT, PAGE, MODE, POWER.
Controls:	VOLUME (audio level), FINE (RTTY space filter)
Indicators:	POWER, CW, MARK, SPACE.

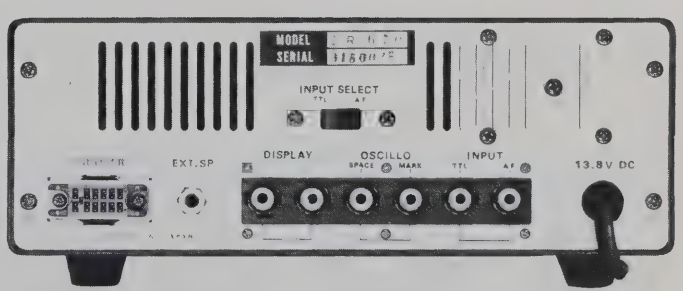
Rear Panel:

Controls:	INPUT SELECT: TTL/AF
Connectors:	PRINTER, EXT SP, DISPLAY, OSCILLO: SPACE-MARK, INPUT: TTL - AF, 13.8 VDC.

Mechanical Specifications:

CWR670:	8.00"W x 2.85"H x 12.60"D (20.3 x 7.24 x 32.0 cm) 5.5 lbs net, 8 lbs shipping 2.5 kg net, 3.7 kg shipping

Power: 12 to 14.5 VDC (13.8 VDC nominal), 0.8 Amps.



DS2050 KSR

LOW COST KEYBOARD SEND-RECEIVE TERMINAL

The DS2050 KSR is a compact and low cost communications terminal for transmission and reception of Baudot, ASCII, and Morse codes (Morse receive optional). The DS2050 represents a logical evolution in terminal design and packaging and incorporates features from two popular and proven HAL products, the DS2000 and ST5000. The functions of both an electronic data terminal and a high quality RTTY demodulator are combined in one compact cabinet. The DS2050 needs only the addition of a video monitor and the transceiver and antenna system to form a complete RTTY and Morse station. Signals are displayed on the video screen in a 24 line by 72 character per line format. Like its predecessor, the DS2000, this terminal provides a top line status indication of selected operating modes and code and the exclusive HAL bright-dim display of received and transmitted text. A 255 character hidden transmit buffer allows pretyping of text to be transmitted even while receiving. When reception is complete, call the pretyped material back on the screen, edit it if necessary, and then start transmitting. Other features such as unshift-on-space (USOS) for Baudot reception, keyboard operated switch (KOS) for automatic transmit-receive control, synchronous idle (IDLE or "diddle"), and QBF and RY test messages are included in the DS2050. The demodulator section of the DS2050 incorporates the popular ST5000 circuitry, but includes all the required direct interconnections between the terminal and demodulator sections. The DS2050 terminal and demodulator sections are compatible with a standard 20-60 ma RTTY "loop" circuit. RTTY printers, keyboards, and tape transmitters (TD's) may be used for both send and receive applications (external loop power supply required for external devices). Connection of the DS2050 to your station is further simplified by the use of standard phone and phono connectors on the DS2050 rear panel.

DS2050 KSR

SPECIFICATIONS

Input/Output:

Audio Input: 0.5v p-p, 600 ohm audio
800 Hz ± 300 Hz for Morse receive (with MR2000)
2000-3000 Hz for RTTY

Audio Output: −32 dBm (20 mV nominal), 600 ohms
All harmonics below 9th are attenuated by more than 30 dB.

LOOP Circuit: Compatible with standard 20 or 60 ma RTTY loop circuits. External loop power supply required for use with RTTY machines, 10 to 200 vdc, 10 to 120 ma (120v, 60 ma recommended for most RTTY loop equipment). Transmitting devices in the external loop circuit (keyboards, tape distributors (TD's), etc.) will key transmit tones and operate with KOS circuitry of the DS2050.

Scope Output: Separate connections for external RTTY tuning oscilloscope horizontal and vertical amplifier inputs; presents standard crossed ellipse indications. Approximately 1.0v p-p output into 1K ohm or greater load.

Data Codes and Rates: Baudot RTTY ("5 level code"); 45, 50, 57, 74, and 100 baud. ASCII RTTY ("8 level code"); 110 or 300 baud (use external modem for 300 baud). Morse Transmit: 5 to 100 wpm. Morse Receive (with MR2000 option); self tracking over 5 to 100 wpm range.

Demodulator Frequencies: U.S. Standard "High Tones"
Mark = 2125 Hz
Space = 2295 Hz (170Hz Shift)
= 2975 Hz (850Hz Shift)
CW ID = 2025 Hz
Transmit tones match receive filter tones to assure true transceive operation.
Note: 425Hz commercial shift may also be received by "straddle-tuning" in the 850 shift mode. The DS2050 may also be supplied for operation with the IARU standard "Low Tones" (Mark = 1275Hz) for export use.

Morse Output: Separate transistor switches to key both positive and negative voltage Morse transmitter circuits.

Display:

Video Output: Standard RS170 video, 1.0v p-p, 72 ohm, 6.1Hz BW

Screen: 24 lines of 72 characters per line.

Polarity: White characters on a dark screen background; two different intensities—bright characters to represent received text, dim characters represent transmit text.

Status: Top line may be used to indicate the DS2050 operating conditions; code, rate, USOS, SYNC, and TX control status are shown.

Tuning Indicators:
RTTY: Front panel tuning meter reads upscale and constant when RTTY signal is correctly tuned.
Morse: Three stars (***) are flashed on lower rght corner of the display; correct tuning indicated when flashing stars synchronize with incoming Morse code (requires MR2000 option).

Transmit/Receive Control: A keyboard operated switch (KOS) circuit can be connected to automatically switch the radio equipment from transmit to receive whenever text is to be transmitted; isolated transitor switch to key positive control line to ground.

Transmit Mode:

WORD Mode: Text is transmitted one word at a time; word is transmitted when first letter of following word is typed or when a new line is started on the screen (NEW LINE key).

Editing: Two display cursors show relative position of transmitted signal from DS2050 (or received signal when receiving) and position of keyboard entry. The keyboard cursor may be back spaced (with RUB OUT key) for editing to any space which has not been transmitted.

Pretype: Up to 255 characters may be pretyped for transmission while receiving when TX HID mode is used. Such text is entered into a non-displayed buffer area while receiving and can then be called up on the screen and edited before being released for transmission. Up to the entire 1728 character screen may also be used for composition of transmit text, but not simultaneous with use of the screen to display received text.

Programmable Messages: Two, 32 character user programmable HERE IS messages; contents of HERE IS 1 also used for CW identification of RTTY signals.

Other Features:

USOS: Unshift-on-space (USOS) for Baudot reception; changes Baudot receiving case back to letters (LTRS) after each space bar character to prevent accidental locking into figures (FIGS) case by noise or interference.

SYNC: Synchronous idle to assist other station's reception. Fills time between transmit characters with LTRS (11111) in Baudot, NUL (0000 0000) in ASCII, and BT (—···—) in Morse.

Keyboard: Standard 52 key ASCII arrangement with SHIFT and CTRL; terminal controls are made with CTRL key plus one of top row of keys. All control features are clearly labeled; commercial quality, high reliability keyboard. RETURN key generates CR -LF- LTRS in Baudot code and CR-LF in ASCII. Baudot FIGS and LTRS codes inserted as required.

Test Messages: The standard QBF test message (THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG'S BACK 0123456789) or alternate code patterns (RYRY RYRYRY ... in Baudot or U*U*U*U*U*... in ASCII).

Sidetone: Sidetone audio with internal speaker to monitor transmitted Morse code; also serves as bell in RTTY modes.

Mechanical Data:

Size: 14.10" x 8.80" x 4.70" (35.81cm x 22.35cm x 11.04cm)

Weight: 12 lbs net, 18 lbs shipping
5.45 kg net, 8.18 kg shipping

Color: Light tan top, dark brown bottom; black and white keytops.

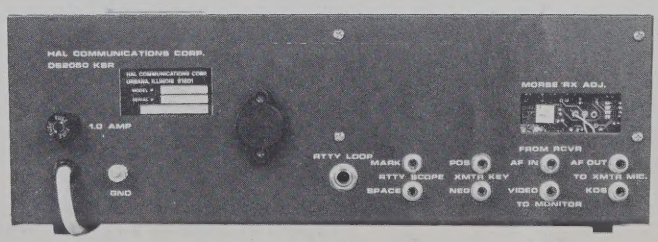
Power Requirements: 105-130 vac 50/60 Hz; 210-250 vac 50/60 Hz; 30 watts

OPTIONS

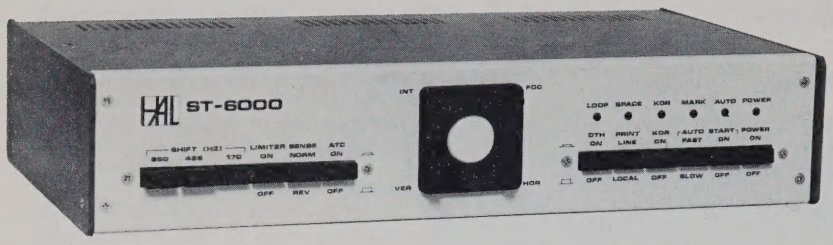
DS2050 —Standard KSR terminal, send and receive Baudot & ASCII, transmit only Morse code.

MR2000—Add Morse receive to DS2050; user installable circuit board fits inside DS2050 cabinet.

KG12 —Recommended 12" monitor. P31 Green phosphor CRT with removable smoked plastic screen cover. 120 VAC, 60 Hz, 39 Watts. Dimensions: 12.25" W x 12" D x 11.125" H, 16 lbs. net, 19 lbs. shipping.



ST6000 RTTY Demodulator



TOP OF THE LINE RTTY DEMODULATOR

Connect the ST-6000 between your transceiver and a HAL DS3100 ASR terminal and join in the fun of amateur RTTY. The ST-6000 provides outstanding recovery of HF RTTY signals, despite noise, interference, or weak signals. Deluxe features of the ST-6000 include a multi-pole active filter front-end, wide dynamic range limiter, either FM (hardlimiting) or AM reception, active filter discriminator and low-pass filters, and internal crystal-controlled AFSK tone keyer. The ATC (Automatic Threshold Control) and DTH (Decision Threshold Hysteresis) features minimize effects of selective fading and multi-path distortion of the RTTY signal. The ST-6000, available with either "Low" or "High" frequency tone sets, receives and transmits 170, 425, and 850 Hz shifts. Other features include internal loop supply, KOS (Keyboard Operated Switch) circuit, autostart, antispace, oscilloscope tuning indicator, and a rear panel with I/O connections for super-flexible interfacing to all data handling equipment. All in all, the ST-6000 is everything you could want in a demodulator.

SPECIFICATIONS

Electrical

Input Data and Rate: Serial Baudot or ASCII code, up to 110 baud.
Input Impedance: 600 ohms, balanced, transformer coupled.
Output Signals: 60 ma @ 175 VDC loop or low-level RS-232C.
Note: An auxiliary loop keyer is available to key a second loop with an external loop supply.
Miscellaneous Output:
Discriminator output to external scope, pre-autostart and post-autostart data, keyboard operated switch (KOS), printer motor AC power.
Autostart Response Time: Slow, 3.5 sec. Fast, 1.5 sec.
Printer motor Dropout Time: 20 sec. ± 10 sec.
Tuning Indicator: 1" scope.
Keyboard Operated Switch (KOS):
Transistor switch to actuate external circuits
Rated +25 VDC, 500 ma.
Frequency of "Low-tone" pairs.

Shift:	850 Hz	425 Hz	170 Hz
Mark:	1275 Hz	1275 Hz	1275 Hz
Space:	2125 Hz	1700 Hz	1445 Hz

Frequency of "High-tone" pairs.

Shift:	850 Hz	425 Hz	170 Hz
Mark:	2125 Hz	2125 Hz	2125 Hz
Space:	2975 Hz	2550 Hz	2295 Hz

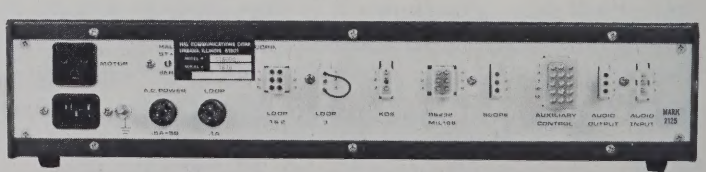
CW ID shifts frequency of tone keyer down by 100 Hz.

Audio Tone Keyer

Input Signal: Dry contacts, EIA-RS-232C levels, or internal current loop, CW ID hand key.
Output Signal:
Levels: variable from −40 dbm to 0 dbm
Impedance: 600 ohm nominal, balanced.
Distortion: All harmonics below the 9th harmonic are greater than 40 db down.
Stability: Crystal controlled to ± .05%

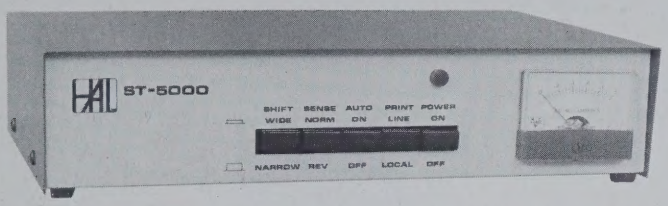
Physical

Cabinet Finish: Castle tan front and rear panel.
Textured chocolate brown top, bottom and side panels.
Cabinet Style: Table or 19" rack mount.
Size: Table: 3.50 H × 9D × 17 W (inches)
8,9 H × 22,8 D × 43,2 W (cm)
Rack: 3.50 H × 9 D × 19 W (inches)
8,9 H × 22,8 D × 43,3 W (cm)
Weight: 12.0 lbs (5,45 kg) net, 15.0 lbs. (6,82 kg) shipping.
Power: 105-125 VAC (210-250 VAC optional)
50-60 Hz, 20 Watts.



(Specify table or rack and high- or low-tones when ordering.)

ST5000 RTTY Demodulator



The HAL ST5000 Demodulator provides reliable RTTY performance on both HF and VHF bands. A hard limiting front end, active discriminator, and active detector make this unit a big value. Standard features include 170 and 850 Hz shifts, normal or reverse sense, autostart, built-in loop supply, and an audio tone keyer.

SPECIFICATIONS

Input: Audio tones, serial Baudot or ASCII code to 110 baud, Impedance 600 ohms - unbalanced.

Output Signals: 60 ma, 175 VDC loop or low-level RS-232C, scope outputs, printer motor power, remote standby line.

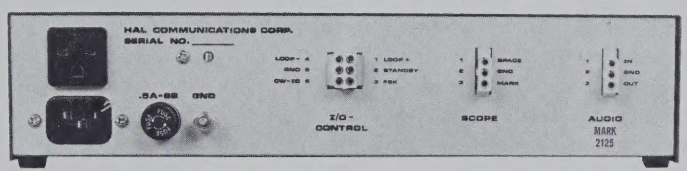
Tuning Indicator: Front panel meter.

Tone Keyer Output: Internally adjustable output level (preset to –32 dbm), Impedance 600 ohms - unbalanced. CW ID shifts frequency down by 100 Hz. All harmonics below the 9th harmonic are more than 30 db down. Tone keyer is equipped for the same tone pairs as the demodulator.

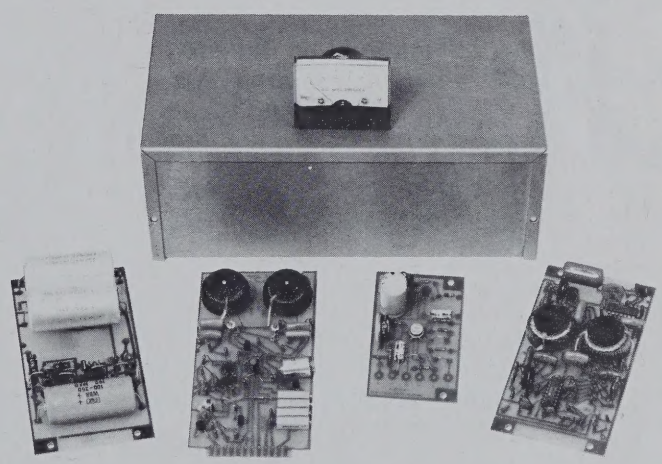
Physical: Light beige front, bottom and rear. Textured blue top and sides. Size: 2.75H x 8D x 12W (inches); 7,OH x 20,3D x 30,5W (cm). Weight: 6.0 lbs (2.73 kg) net, 9.0 lbs (4.10 kg) shipping.

Power: 105-125 VAC (210-250 VAC optional), 50-60 Hz, 20 watts.

(NOTE: Specify high or low tones when ordering.)



Demodulator Kits



ST-6K

HAL still offers the famous ST-6 demodulator in kit form for the experienced technician. The ST-6K features input bandpass filters, wide dynamic range limiter, balanced discriminator, active low-pass filter, ATC, autostart, and anti-space. In addition, the output tone keyer is crystal controlled for high stability. The ST-6K provides an extremely good demodulator value for the experienced builder.

SPECIFICATIONS: Input - audio tones (RTTY "high" tones for 170, 425, or 850 Hz shifts), 600 ohms, unbalanced input. Output signals - 60 ma/175 VDC loop or low level (RS-232 compatible). Front panel tuning meter. Crystal controlled tone keyer for 170 and 850 Hz shifts. CW ID tone is 100 Hz down from mark. Size: 3.5 H x 12 D x 17 W (19 W for rack mount) inches. Weight 14 lbs. net, 16 lbs. shipping. SPECIFY TABLE OR RACK MOUNT.

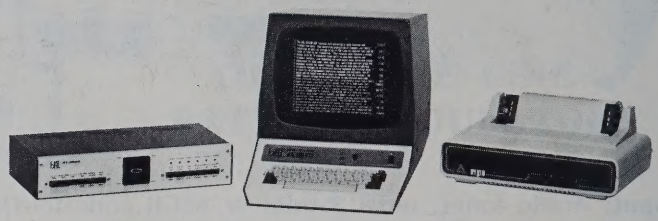
ST-5K

The ST-5K is a good first demodulator for the experienced kit builder. The ST-5K package features a wide dynamic range limiter, balanced discriminator, solid state loop switch, autostart, tuning meter, and AFSK oscillator. An unscreened and undrilled Bud 2110 minibox is provided to be tailored to the user's requirements. The ST-5K is the lowest cost method for becoming active in RTTY with HAL equipment.

SPECIFICATIONS: Input - audio tones (RTTY "high" tones for 170 and 850 Hz shifts), 600 ohms, unbalanced input. Output signals - 60 ma/175 VDC loop or low level (RS-232 compatible). Tuning meter. Audio tone keyer for 170 and 850 Hz shifts. Size: 10 x 6 x 3.5 inches. Weight 7 lbs net, 8 lbs. shipping.

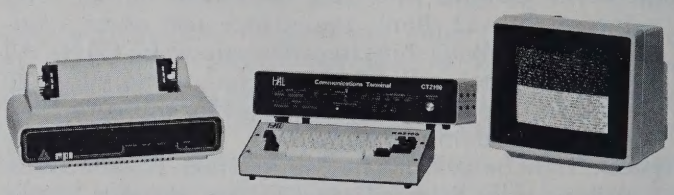
SYSTEM I

This is the top-of-the-line HAL combination for the serious RTTY enthusiast. It is composed of the DS3100 ASR with MSO3100, ST6000, and optional printer. HAL can supply cable set number C-1 to interface this system to your transceiver. Put this combination in your shack for the most complete and convenient system available today.



SYSTEM II

This is the popular CT2100 system from HAL which includes the KB2100, KG12 Monitor, and optional printer. It offers a unique combination of features at a reasonable price for the radio amateur or short-wave enthusiast. Cable set C-2 interfaces this system to your transceiver. Complement your shack with this attractive and extremely versatile system from HAL.



Prices and specifications are subject to change without advance notice.

#1082

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